SA Development Tech LLC   Press Monitor 1.11

Manual

```
Next --> Pull Handle DOWN...
 534 Rnds  1:37 Time  342 RPHc   299 RPHt
```

Disclaimer:

Many things can go wrong during the reloading process and it is entirely your responsibility to load ammunition safely using proper reloading precautions. Reloading ammunition requires complete attention to detail. While it is reassuring that the Press Monitor will monitor your press actions electronically, any electronic device can fail. In addition, the Press Monitor can only monitor part of the process and is unable to detect if the wrong load information or wrong powder is used. To be used exclusively as industrial test equipment. For these reasons, SA Development makes no guarantees and is not liable for any issues that may arise from its use or malfunction.

Table of Contents:

Introduction

First, Thank you for purchasing a Press Monitor. We hope you enjoy your monitor for many years to come!

Included items:

Press Monitor Main Unit
Power Supply
Wiring Harness
Press Sensors
Press Light LED
Press Light Mounting Tube
Press Light Mounting Wire
Cable Ties
Double Stick Tape
Heat Shrink Tubes

New alkaline backup batteries are already preinstalled. The backup battery will keep the unit running if the wall power goes out in the middle of a reloading session. The status of this battery is displayed when powered on (or when the press light button is held for 3 seconds).

Please email us if you have any questions or issues we can help with!

Feature Summary

Press Monitoring: Watches the actions taken on the press and alerts the user if any action is incorrect or out of sequence. This will alert the user to mistakes such as the press handle is not cycled fully up or fully down. On manual indexing presses such as the Dillon 550 it will also alert the user to the very serious mistake of forgetting to rotate the shellplate. **Press Monitoring can prevent the user from loading a double charged or squib round by catching and reporting these types of errors.**

Realtime Statistics: Displays **four, six, or eight** realtime statistics about the current session: Loaded Rounds (Rnds), Press Time (Time), Rounds Per Hour Current (RPHc, last 3-15 rounds), Rounds Per Hour Total (RPHt), Remaining Rounds (RmRd), Remaining Press Time (RmTm), Powder Measure Grains (PmGr), and Powder Measure Rounds (PmRd). Even if only four or six are displayed, they can be rotated so that all eight can be viewed.

Long Term Statistics: Stores and displays three long term statistics: Total Rounds, Total Press Time, and Total Rounds Per Hour.

Press Light: Supports a light to illuminate where the bullet seating station so the user can see that the proper amount of powder is present. This light is completely controllable in intensity and is also used as an error indicator (it will blink) for users who are hearing impaired.

Powder Low Reminder: Powder tracking keeps track of the powder in the powder measure and issues a reminder if the level falls below a specific weight.

Press Maintenance Reminder: Keeps track of when maintenance is due on the press. The user can choose to monitor usage by rounds or hours. (optional)

Interval Reminder: Can be configured to issue a reminder every 5-1000 rounds. If set to 100 rounds for example, it will remind the user at 100, 200, 300, 400, and so on.

Powder Usage Analysis: Analyzes how many grains of powder were consumed compared to the charge weight times the number of loaded rounds. Indicates the actual charge weight such as 6.324 grains based on how much powder was consumed.

Power Management: Dual power system automatically switches to one of two available power sources. This will keep the monitor available and running even if main wall power goes out. It can adjust power consumption when running on battery automatically, and can also turn off the press light or LCD backlight if necessary to prevent the unit from shutting down or restarting.

Press Mode Detection automatically determines the current press state when starting up, leaving setup, or leaving ignore mode.

Break Reminder: Reminds the user to take a break periodically. (optional)

RPHc Too Fast Reminder: Reminds the user if he is going too fast and exceeding a specific RPH. (optional)

LCD Backlight: Supports a LCD backlight to make the display more readable in all light conditions.

Setup, Diagnostics, and Advanced Settings: One of the best features of the Press Monitor is that it has easy to use English menus are that consistent and simple. So each in fact that the user will likely be able to go into setup and figure out everything without consulting the manual. It is organized into three sections. **Setup** is where most of the common options are and are options the user will likely need to change. **Diagnostics** is where the Press Monitor hardware can be tested, sensors can be checked, or calibrations viewed or changed. **Advanced Settings** are settings the user isn't likely going to need to change and are put in the advanced settings area to reduce the number of options in the main setup area.

Fully Customizable: The user can customize almost every option and feature in the Press Monitor. Do not be overwhelmed by all the features; Usage can be as simple as turning on the unit and beginning loading. More advanced features can be turned on as desired.

Press Sensor Installation

One to three press sensors are required depending on two factors:

The first decision that needs to be made is which Press Mode will be used. There are two Press Modes: "Monitoring And Statistics" or "Statistics Only".

"Statistics Only" disables the monitoring feature and may be a good choice for presses that are already very bulletproofed against user mistakes. A Dillon 1050 for example has both autoindexing and a physical short stroke preventer. The benefits of this mode are that the user only needs to mount a single sensor and that all eight statistics are displayed at the same time.

"Monitoring And Statistics" enables the monitoring feature and the Press Monitor will watch press actions and report errors. This is the mode that most people should implement. Two sensors are required for autoindexing presses and three sensors are required for manual indexing presses. A Dillon 550 is ideal for this mode because it will catch short stroke, double stroke, double rotate, and other errors.

At this point, the user should know how many sensors they plan to install and it is time to install them on the press. The wiring harness provided has been prepared by stripping off the outer insulation to expose 4 twisted pairs:

> Orange Pair = Press Handle Down Sensor (Stripe=Ground, Solid=Sense)
> Blue Pair = Press Handle Up Sensor (Stripe=Ground, Solid=Sense)
> Green Pair = Shellplate Rotate Sensor (Stripe=Ground, Solid=Sense)
> Brown Pair = LED Press Light (Stripe=Cathode, Solid=+5V)

The provided press sensors are microswitches that detect when the press is in a specific position. The striped wire is ground and needs to be connected to the "C #1" on the microswitch. The solid is the sense wire and should be connected to the "NO #3" on the microswitch.

According to the 3M technical person, the best plan is to get both sides of the tape completely "wetted" against the surface they are bonding to. They said to imagine putting a piece of transparent tape down on a tape and then pressing it all around to make sure it is completely sealed against the tape with no air gaps, etc.

The best method to do this is to clean both the press and switch surfaces that the tape will connect to using a paper towel or q-tip and rubbing alcohol. It won't hurt to repeat with a new paper towel or q-tip again to make sure the surfaces are very clean and free of oil. Allow the rubbing alcohol to evaporate completely. Oversize the tape slightly compared to the sensor size, this will give the tape more grip on the press surface. The sensors are a little smaller than 7/16" x 13/16". Cut the tape to 11/16" x 1 1/16" as this will give a 1/8" edge all around the switch to grab the press a little more. It may be necessary to do 9/16" x 1 1/16" for the Dillon 550 column (rotate and handle up sensors) since it is only 9/16" wide.

Figure out close to where the sensor will be and figure out where to stick the tape. Stick the tape to the press first so it can be firmly pressed into the press surface. Get a paper towel and rub it into the press from all angles for the best bond. It would probably be easier to put the tape on the sensor first, but the press surface is textured and more difficult to bond to so doing it this way allows the tape to bond the best it can to the press surface.

Once it is pressed in good, remove the liner and stick the sensor to it. Don't worry if the sensor isn't centered on the tape as long as it is where it needs to be. Just press it very lightly and test it before pressing it solidly. Once pressed, test the press to see if it activates the sensor properly.

To really connect the sensor, push firmly on it and give it a little push in all directions just to make sure it is stuck good. Clamp the sensor using a small clamp. Use some cardboard on the other side of the clamp so it doesn't mar the press as all. There is no need to apply a ton of pressure, just a little bit. The goal is to make sure it stays firmly put during the curing time and a little pressure will help.

Curing time is 72 hours according to 3M, but it will be pretty good in 24 hours. It is really temping to get started and use the Press Monitor immediately, but allowing the tape to cure properly will really ensure a good long term bond.

The switches can be soldered on the press or ahead of time, whichever is easier. It makes sense to bend the contacts on the back of the switch at an angle if it is put somewhere with limited clearance (like the Dillon 550 column). Just don't bend them back and forth repeatedly because they are copper and a few times back and forth and they will break off.

Properly installed and clamped, the tape will do the job; however, sensors can also be attached with #2 56tpi socket head bolts and nuts/tapping. These are quite tiny and only require a very small 3/32" drilled hole. It is recommended that the double stick tape is still used to test switch location before drilling the holes and using some small bolts. Even a mix of using the tape to keep the position of the switch fixed and a single #2 56tpi socket head bolt to keep it from pulling away from the press can be a great compromise.

It is best to solder the microswitches to the wiring harness, but if the user does not have a soldering iron (they aren't much to buy), they can always strip off 1 inch of wire, run it through the eyelet, and wrap it around the eyelet again and again tightly. Finally cover it up with a heat shrink tube and heat the tube with a lighter to shrink the tubing.

If Press Monitoring is going to be disabled and only a single sensor installed, the green pair (rotate) must be connected to it.

If Press Monitoring is enabled:

The orange pair (handle down) must be connected to a sensor that is hit when the press handle is down. It might seem like detecting this using a microswitch located near the shellplate when it is at its fully up position is a good place, but I don't advise this because the shellplate moves very little when at

the top end of travel even when the handle has quite a bit more movement to go. A far better place to put this sensor is on the bottom of the press handle itself. See the 550 or 650 sensor locations section for some pictures of an excellent handle down sensor location.

The blue pair (handle up) must be connected to a sensor that is hit when the press handle is up. A little care must be selected with this sensor because it needs to be hit both when the press is at rest with the handle up and it also needs to tolerate the handle being pushed forward to prime as well. The shellplate on a 550 is a good place to detect this and a location underneath the shellplate on the back right of the 650 is also a good place.

The green pair (rotate) only needs to be connected on a manually indexing press. It should be left disconnected for automatic indexing presses. If the user ordered their Press Monitor with a manual indexing press harness, this sensor is included and has already been formed so that half of its lever is cut off. See the 550 sensor location section for the best place to detect shellplate rotation.

The Press Light should light up the charged case at the bullet seating station so the user can clearly see if about the correct amount of powder is present or not. **This is one of the most important reloading safety rules: look into each case before putting the bullet on it to make sure it has about the right amount of powder**. These parts are included: LED, Plastic Tube, and a couple of wire ties. The plastic tube is to block light coming from the side of the LED and focus it on the bullet seating station. Fasten some 16 gauge copper wire to the plastic tube and the other end of the wire to the press. The wire can be folded into a spring that allows the user to push it into the hole in the left rear top of the 550, or just attached with a cable tie. LED's have an anode and a cathode. Polarity is important for these two wires, the solid brown wire must go to the longer lead on the LED. The striped brown goes to the shorter lead. If the leads have been trimmed to the same length, looking at the base of the LED can indicate which lead is which: The larger metal surface inside = shorter lead = striped brown. **If the user does not implement the Press Light, make sure the solid brown wire is taped off and not allowed to connect to ground because it is +5V.**

The Press Monitor is very flexible in its inputs. A user can use the supplied microswitches, or even use a variety of other types of sensors: magnetic, proximity, optical, etc. Some of these sensor types will require a voltage and ground and both of these are provided in the wiring harness.

Dillon 550 Recommended Sensor Locations
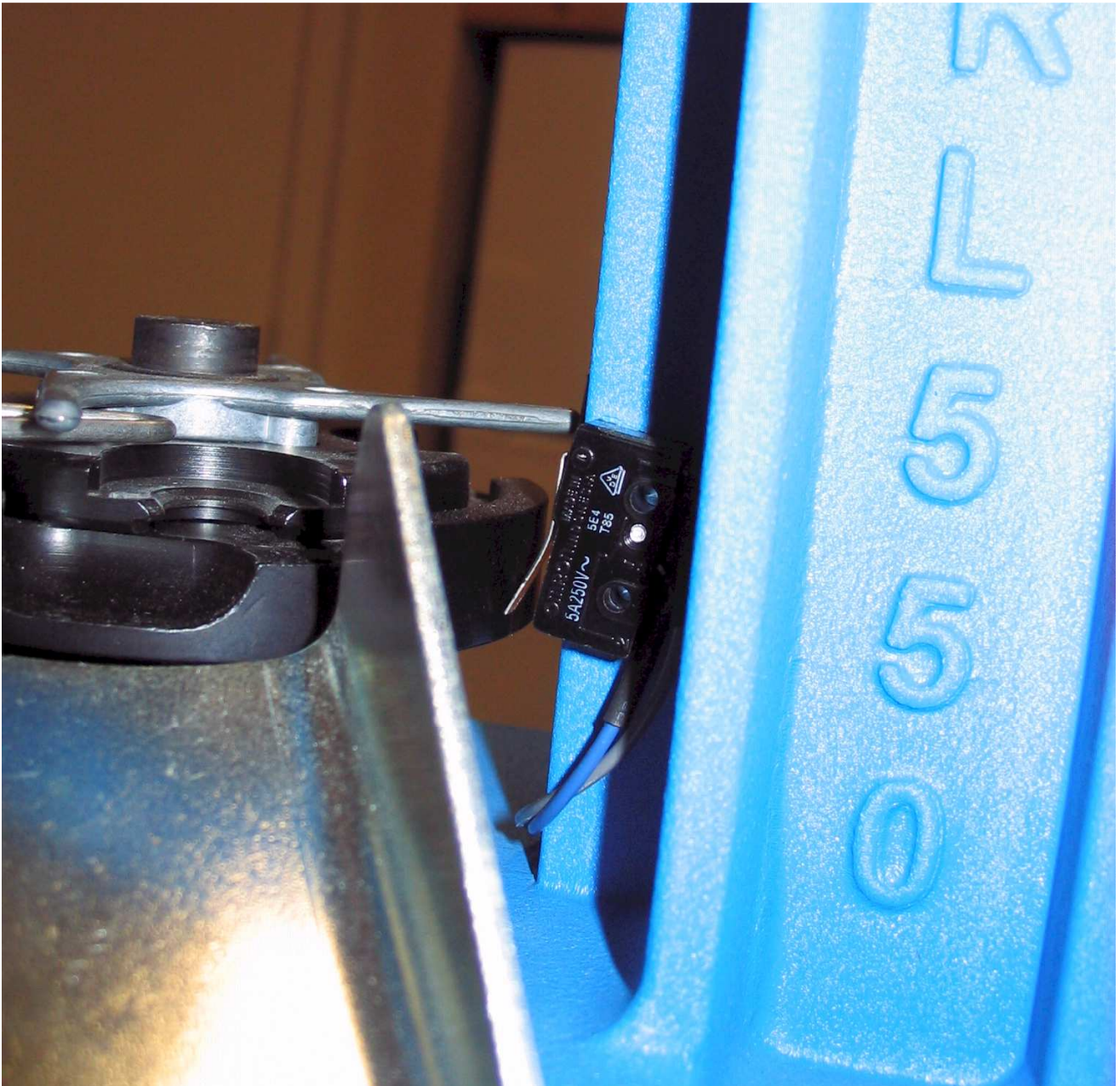
The best place to sense the handle up on the Dillon 550 is on the right side of the rear column. Note that this shellplate is at rest and that the end of the lever is near the bottom of the shellplate. This allows the shellplate to drop slightly further when priming is occurring and still the end of the lever will be activate and will not reach the top of the shellplate.

The handle down sensor senses when the handle is down and on the Dillon 550, the best place to sense this is on the handle linkage itself. Note that when the handle is fully down, there is no pressure on the switch itself, just that the switch lever is activated.

This is the switch that detects the star movement when the shellplate is rotated. It should be mounted on the left of the column so that the lever points up so that the star hits it as it goes by. Put the switch in place when the star is contacting it (like in the picture above). A very slight amount of counter clockwise skew helps. Just make sure that when the shellplate comes back down it is no where near hitting the end of the lever.

If you go with the bolted mounting method you will note that these two switches are directly across from each other. If you are using double stick tape this is no issue. With bolts you have a couple of options. Option 1 is to simply attach each switch with a single bolt and skip the two that overlap. This option works best with double stick tape because that will keep the switch from rotating and the bolt will keep it from coming off. Option 2 is to line up the overlapping holes with each other and use a single longer bolt to attach both switches. Use the rotation sensor to choose the location of this hole as it is the more sensitive switch to its position. The handle up sensor is more flexible and you can adjust its angle or even bend its lever to make it work properly.
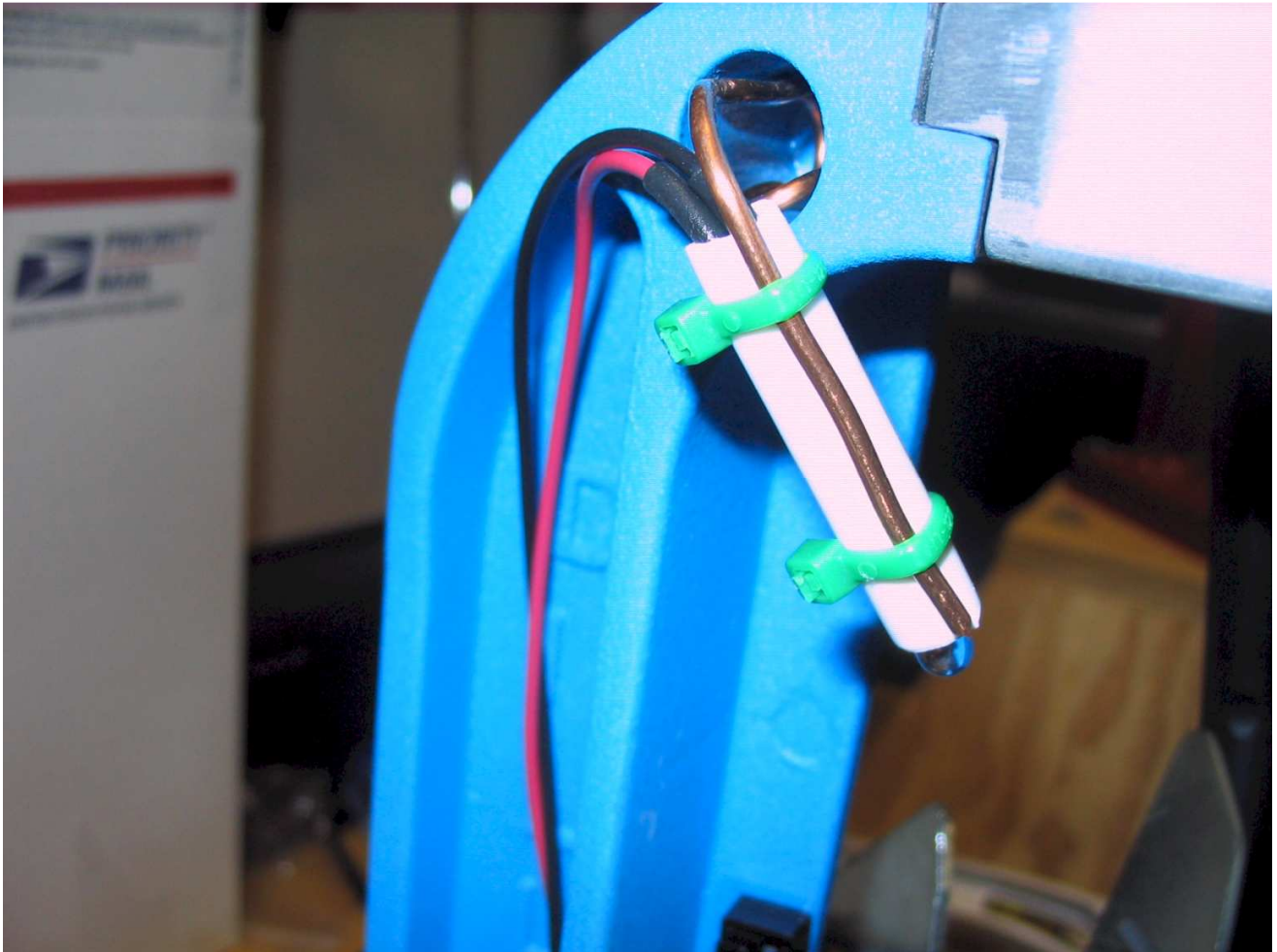
This is an easy way to attach the Press Light on a Dillon 550. Cable tie the plastic tube to the copper folded wire (now in a matching blue) and use the copper like a spring so that its tension will hole it in the hole on the top left side of the press. The copper can be adjusted to that the tube aims perfectly at station 3 where the bullet is seated. The LED simply hangs in the tube, in the picture it somewhat protruding.

Dillon 650 Recommended Sensor Locations
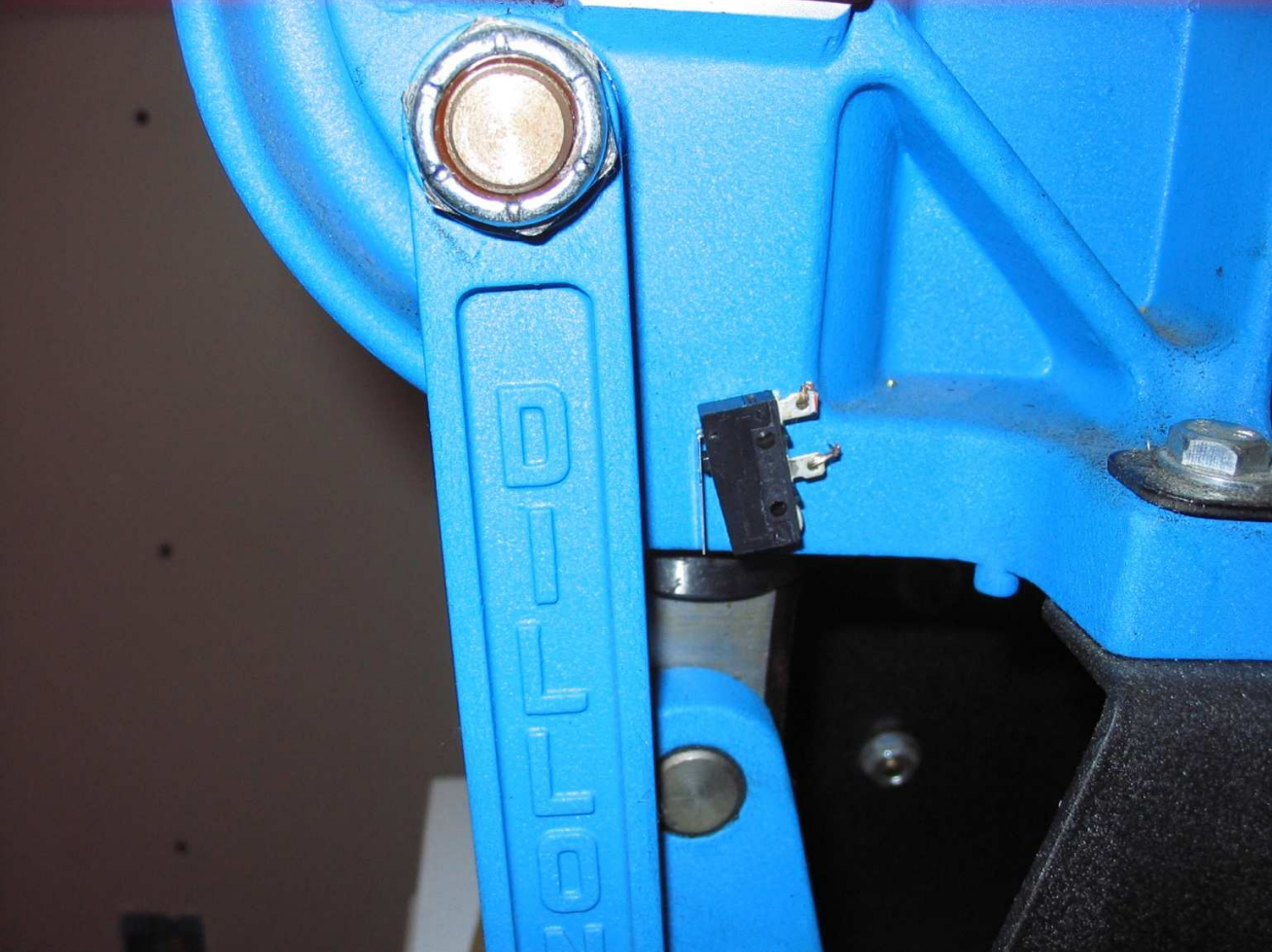
This picture shows the recommended location for the press handle down sensor.

This picture shows the recommended location for the press handle up sensor. It is on the right back side of the press where there is a nice flat surface to mount the sensor. It should be mounted so that the lever is pointing towards the user. There is something that comes down with the shellplate that will hit it in this location. One thing about this sensor is that it needs to be set when the press handle is at rest, and also tolerate a little more movement when the user pushes forward on the handle to seat the primer. It is recommended that the lever is bent in the middle perhaps 30 degrees so that it extends upward a little more.

First Use

When first turned on, the Press Monitor always displays the product name, version, and company name for 3 seconds:

```
Press Monitor 1.11
SA Development Tech LLC     (s/n PM000001)
```

```
Press Type?
Dillon 550                    SDB [      ] OT
```

This is a typical prompt displayed by the Press Monitor. A question is being asked on the top line and the answer or value is at the beginning of the second line. There is a graph at the end of the second line that indicates where the current setting is in relation to all settings available. The graph is not as useful for a yes no question because it is either empty for no, or full for yes. It is much more useful for questions that have a larger range since it indicates both the size of the range and the current position within it. In this case the lowest option is SDB (Square Deal B) and the highest option is OT (Other Turret). The user should now select their press type. Simply use the plus and minus buttons, and then press ignore to continue. The Press Monitor supports 11 popular reloading presses, but can also support presses not listed using the other progressive or other turret types.

The next question is the Press Mode:

```
Press Mode?
Monitoring And Statistics     SO [IIIIIIII] MAS
```

See the Press Sensor Instalation section above to decide how to answer the Press Mode question. The options are either Statistics Only (1 Sensor) or Monitoring And Statistics.

```
Change Press Settings?
No                            No [      ] Yes
```

At the end of any section where options are being prompted for, the user will be asked if they wish to re-enter that section again to make any changes. If everything was entered correctly, just press ignore

to continue. If not, press plus to change to Yes and then ignore. The user can then again select the Press Type and Press Mode options.

The Press Monitor now displays messages it normally does when turned on. Each one is displayed for 3 seconds. Each of these can be disabled for a faster startup if desired.

```
0 Rounds, 0.0 Hours

                          Press Totals
```

The Press Totals display shows the total number of rounds, hours, and rounds per hour for all loading sessions. The rounds per hour is not in the above example because there is no data yet, but rounds per hours is also displayed normally.

```
3000 Rounds Remaining (100%)
0% ▐█████████▌ 100%          Press Maintenance
```
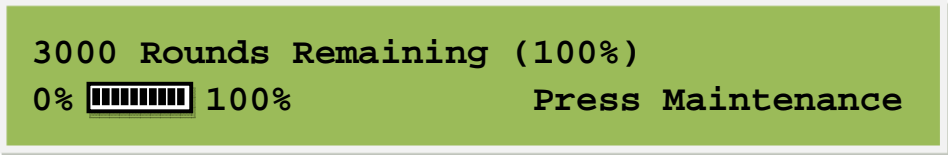
The Press Maintenance display shows the number of rounds until press maintenance is due. The user can track press maintenance by hours instead of rounds if desired. When press maintenance is due a reminder will popup on the display until the user resets it.

```
Main 12.12V          Battery 8.71V
Supplying 100%       Available  ▐████▌
```
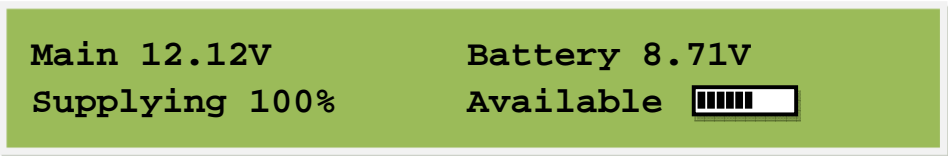
The Power Status display shows the status of both power inputs and which one is supplying power. This example shows that the main was supplying 100% of the power and the battery is available. The battery graph shows where it is in its range of low to high voltages. It is useful to glance at this display during power on to see the status of the backup battery. If main wall power drops out, it will automatically switch to battery power instantly so it is important that a backup battery is ready to provide power if necessary.

The next display is typically one of the following (monitoring mode):

```
Next --> Pull Handle DOWN...
   -3 Rnds  0:00 Time    - RPHc    - RPHt
```

or:

```
Next --> Unknown State...
▓▓▓▓▓▓▓▓▓▓▓▓  IGNORING SENSORS  ▓▓▓▓▓▓▓▓▓▓▓▓
```

The ▓ symbol above blinks to get the users attention. The first message indicates the Press Monitor is monitoring the press and the user can begin loading. The top line shows what the next action should be and the bottom line shows the realtime statistics.

The number of rounds begins at a negative number on progressive presses because that is the number of stations on the press minus one. This is done so that when the first round hits the finish bin, the loaded rounds will be correct at 1. See the Realtime and Long Term Statistics chapter for information on the other statistics.

The second message is ignore mode. This mode ignores press sensors and allows the user to correct any issue while the press monitor is disabled. Unknown press state means that the press is not in a state that can be resumed from. For example, when the shellplate or toolhead is not fully up or down, this message is displayed. As soon as the press sensors indicate the press is in a state can be resumed from, this message changes to a message like Next → Push Handle DOWN. Simply press ignore again to leave ignore mode and resume normal operation.

Error Messages

When out of ignore mode, the user can begin loading. All the press actions are monitored and if the Press Monitor detects an incorrect action, it will alert the user. This triggers the buzzer, displays the error message, and flashes the press light (if enabled).

To stop the buzzer and cancel the error, press ignore. This takes the user to ignore mode. The press should be checked and any issues should be corrected. After verifying all stations are ok and ready to resume, the user can press ignore again to leave ignore mode and resume normal monitoring. If a round was finished up when ignore mode was enabled, press the + button to add that round to the rounds counter. Similarly, the – button can be used to adjust for a damaged round when the sensors were not being ignored.

```
██████████  DOUBLE SHELLPLATE ROTATE  ██████████
███████████████  CHECK ALL STATIONS  ████████████
```

Double Shellplate Rotate: Displayed when the shellplate is rotated twice by mistake on a manual indexing press. **This is a very dangerous condition as it usually leads to a no charge event.**

```
█████████████████  SHORT STROKE  ████████████████
███████████████  CHECK ALL STATIONS  ████████████
```
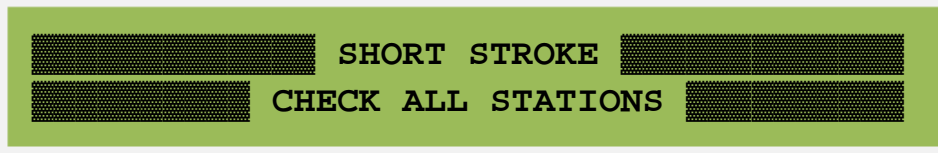
Short Stroke: Displayed when the press handle is not pulled fully down. Can cause a round to not have any powder or in it, or less powder that desired if the powder measure was not fully activated.

```
████████████████  DOUBLE STROKE  ████████████████
███████████████  CHECK ALL STATIONS  ████████████
```
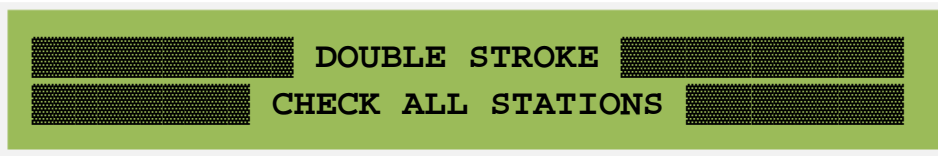
Double Stroke: Displayed when the press handle is cycled twice without rotating the shellplate on a manual indexing press. **This is a very dangerous condition as it usually leads to a double charge event.**

```
███████████████  BAD SEQUENCE  ███████████████
███████████████ CHECK ALL STATIONS ███████████
```
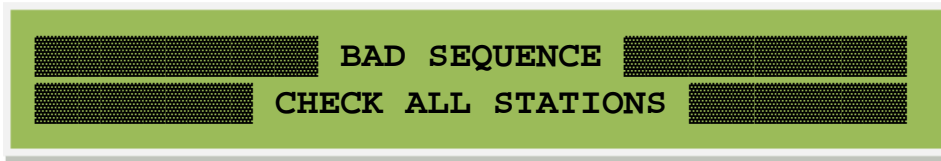
Bad Sequence: Displayed when any unexpected action occurs. The Press Monitor expects a very specific sequence of actions and if the actions deviate at all, this error is generated.

Reminder Messages

Reminder messages are different than errors because they do not interrupt press operation. The user is free to continue working right on through a reminder without stopping. Press actions remain fully monitored during a reminder. A very short buzzer sounds just to let the user know a reminder is on the display. Reminders stay on the display for 5 seconds.

If the plus button is pressed during the reminder display, the reminder will be disabled for the entire session. It can be re-enabled by entering setup.

There are 5 reminders currently available: Low Power Reminder, RPHc Too Fast, Press Maintenance, Low Powder, and Break. Reminders automatically repeat based on the Reminder Delay Time available in setup. If more than one reminder is active, they rotate their display automatically.

```
RPHc Faster Than 1200 RPH
Press + To Disable This Reminder
```

Here is an example of the RPHc Too Fast reminder. The user can change this threshold to another value or disable this reminder completely.

Button Use

The buttons perform differently depending on whether they are pressed and released, or held down.

Minus Button:

In normal mode, the minus button changes the realtime statistic Rnds by decreasing it. This can be used if a round was destroyed or lost during the reloading process.

```
Press Timer Stopped; EEPROM Values Saved
```

Holding the minus button in normal mode will stop the press timer and write EEPROM values immediately.

In ignore mode, the minus button may be used to change the next action on some press types. If the prompt is Next → Pull Handle DOWN… but the user wants the next action to be rotate, just press the minus (or plus) button and it will change to Next → ROTATE…

If a prompt requests a value or setting, the minus button will make the setting less. Holding the minus button changes the setting faster, and the longer the button is held the faster it changes.

Plus Button:
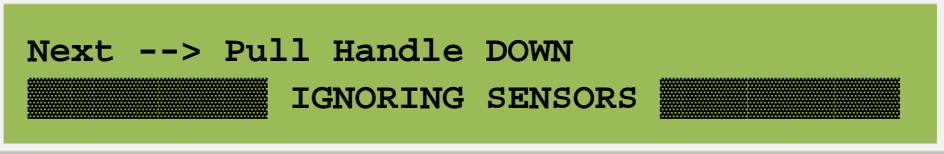
In normal mode, the plus button changes the realtime statistic Rnds by increasing it. This can be used if a round was completed when the Press Monitor was in ignore mode.

Holding the plus button in normal mode changes the realtime statistic currently displayed. It rotates between Rnds/Time, RmRd/RmTm, and Rnds/RmTm.

In ignore mode the plus button may be used to change the next action on some press types.

If a prompt requests a value or setting, the plus button will make the setting more. Holding the plus button changes the setting faster, and the longer the button is held the faster it changes.

Ignore Button:

```
Next --> Pull Handle DOWN
▓▓▓▓▓▓▓▓▓  IGNORING SENSORS  ▓▓▓▓▓▓▓
```

In normal mode, pressing the ignore button changes to ignore mode. Pressing the ignore button again returns back to normal mode if the press is ready to do so.

```
Entering Setup...
```

Holding down the ignore button enters setup and diagnostics:
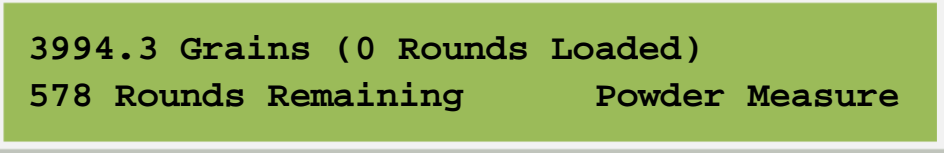
```
Break Reminder
Press + to Disable this Reminder
```

Pressing the ignore button during a reminder allows the user to disable that reminder.

Pressing the ignore button at a prompt tells the monitor to accept the value and continue.

LCD Backlight Button:

Pressing this button changes the current LCD Backlight setting. If the LCD Backlight Steps setting is configured for 2 steps it will go from off to on then and back to off again. If configured for 3 steps it will go from off to low to high and then back to off again. If configured for 4 steps it will go from off to low to medium to high and then back to off again.

```
3994.3 Grains (0 Rounds Loaded)
578 Rounds Remaining     Powder Measure
```

Holding the LCD Backlight button shows the current powder measure status including current grains, rounds loaded, and rounds remaining:

Press Light Button:

Pressing this button changes the current Press Light setting. If the Press Light Steps setting is configured for 2 steps it will go from off to on then and back to off again. If configured for 3 steps it will go from off to low to high and then back to off again. If configured for 4 steps it will go from off to low to medium to high and then back to off again.

```
Main 12.28V          Battery 8.71V
Supplying 100%       Available ▐▋▋▋▋▋▌
```

Holding the Press Light button shows the power status just as it does during startup, so the user can see what the main and backup battery power status:

Realtime and Long Term Statistics

```
Next --> Push Handle UP and PRIME...
 534 Rnds  1:37 Time  342 RPHc  299 RPHt
```

There are eleven statistics automatically calculated for the user.

Loaded Rounds (Rnds): Keeps track of the number of rounds loaded. The user can press the minus or plus buttons to change this value if a round is lost or finished during ignore mode.

Press Time (Time): This timer starts and stops automatically based on press sensor activity. The default setting for press timer inactivity is 30 seconds, which means if the press does not change for 30 seconds, then the press timer stops. The user can check if the press timer is running by looking at the colon between the hours and minutes. If the colon is blinking, then the press timer is running. If the colon is not blinking it is stopped. Press Time is used for calculating rounds per hour total, and since the timer stops, the user can walk away from the press for 10 minutes without it affecting the RPHt calculation. A short inactivity of 30 seconds or so would not include tasks such as filling primer tubes or refilling components in the rounds per hour total figure. Selecting a longer Press Timer Inactivity such as 30 minutes allows the user to include these routine tasks in the calculation.   In this case, the press timer would continue running for up to 30 minutes even if the press does not change. To walk away from the press and not include that time in the statistics, the user needs to hold the minus button to stop the press timer manually.

Rounds Per Hour Current (RPHc): Calculates a rounds per hour value for the last 3 to 15 rounds loaded. If no changes are detected in 30 seconds, it goes to zero and needs 3 loaded rounds to begin calculating again. A reminder can be enabled if this exceeds a specific value.

Rounds Per Hour Total (RPHt): Calculates a rounds per hour value for the entire session by dividing the loaded rounds by the press time.

The next two statistics requires the user to specify the number of rounds being loaded.

Remaining Rounds (RmRd): Indicates how many rounds are remaining.

Remaining Time (RmTm): Calculates how much time is remaining based on the rounds per hour total and how many rounds are remaining.

The next two statistics requires the user weigh their powder container before and after dumping powder into the powder measure. The Press Monitor uses these two values to calculate how much powder is in the measure. There is no sensor on the powder measure, but the Press Monitor will keep track based on the information provided to it.

Powder Measure Grains (PmGr): Displays how many grains are remaining in the powder measure.

Powder Measure Rounds (PmRd):   If there is powder in the powder measure and the user has specified the charge weight, this statistic will calculate how many rounds could be loaded until running out of powder.

Of these eight statistics, four or six can be displayed at one time when Press Monitoring is enabled, or all eight can be displayed at one time if Press Monitoring is disabled. For four or six modes, the user can select which of the eight are displayed by holding down the Swap Stats to rotate the currently displayed ones. There is also an option in setup that will automatically rotate which ones are being displayed every so many seconds.

```
Next --> Push Handle UP and PRIME...
 534 Rnds  1:37 Time  342 RPHc  299 RPHt
```

This is an example of full line instructions (Press Monitoring enabled) where the entire top line is used for press instructions and the bottom line has four statistics:

```
8522 PmGr  2:23 RmTm     Pull Handle DOWN
 534 Rnds  1:37 Time  342 RPHc  299 RPHt
```

This is an example of half line instructions (Press Monitoring enabled) where half of top line is used for press instructions so there is room for two statistics on the top line and the bottom line has four statistics:

```
123 RmRd  2:23 RmTm 8522 PmGr 1982 PmRd
534 Rnds  1:37 Time  342 RPHc  299 RPHt
```

This is an example of all eight statistics displayed (Press Monitoring disabled) where both lines are used to display statistics:

```
321 Rounds, 1.2 Hours, 268 RPH

                          Press Totals
```

The final three statistics are displayed at startup or can be viewed at any time in setup:

Total Rounds: Keeps track of the total rounds loaded.

Total Press Time: Keeps track of the total time the press is used.

Total RPH Average: Calculates a rounds per hour average across all reloading sessions.

Press Types

```
Press Type?
Hornady Lock N Load              SDB [III    ] OT
```

The Press Monitor supports 11 popular presses, plus two custom press types. The supported presses are: Dillon Square Deal B, Dillon 550, Dillon 650, Dillon 1050, Hornady Lock N Load, Lee Classic Turret, Lee 3 Hole Turret, Lee 4 Hole Turret, Lee Load Master, Lee Pro 1000, RCBS Pro 2000.

There are also two custom press types that allow complete flexibility to support any progressive or turret press. It is important to understand that there are two types of turret presses. The first type functions as a single stage where the turret head is rotated basically just to change dies, but rounds are still loaded in batches as they would be on a single stage. The second type functions similarly to a progressive, in that a single spent case is put in and that case goes through all stations and is a completed round afterwards. The Press Monitor is designed to support the second type of turret.

If one of the built in 11 press types is selected, then no further prompts appear. If the user selects Other Progressive or Other Turret, these are prompted for:

```
Press Stations?
4 Stations                          1 [IIII   ] 8
```

Press Stations specifies how many stations a press has. For a turret press, it determines how many cycles the press must go through before a round is loaded. For a progressive, Press Stations determines the negative starting value for Rnds so that when the first round hits the finish bin, the Rnds counter reads 1. The range is from 1 to 8.

```
Press Auto Index?
No                                  No [      ] Yes
```

Press Auto Index indicates whether the press automatically indexes (rotates) to the next station. If not, then the user must perform this action manually and the third sensor to detect rotation is required. This option determines the expected sensor pattern for press actions and also whether the rotation sensor will be available in setup dialogs.

```
Press Priming Message Mode?
On Handle Up                    Off ┌──────┐ HU
                                    └──────┘
```

Press Priming Message Mode specifies if and where the "and PRIME" message is added into the next message instruction. It only affects the message and not any other operation. It is also only displayed if full line instructions are used. The values are Off, On Handle Down, On Handle Up. Most presses prime on handle up.

```
Press Timer Inactivity?
30 Seconds                      15s ┌──────┐ 30m
                                    └──────┘
```

Press Timer Inactivity specifies the inactivity period for the press sensors that will stop the press timer. See the statistics chapter for more information.

Powering Off and EEPROM

All the values in setup as well as the long term statistics, such as total loaded rounds, are stored in EEPROM memory. This is a type of memory that stays intact when the unit is powered off. One of the issues with this type of memory is that it has a design life of 100,000 write cycles, so it is important not to write to it continuously. At the same time, there are values that the Press Monitor needs to constantly update such as total loaded rounds or total press time.

To address this issue, the Press Monitor updates values every 90 seconds instead of as they change. The Press Monitor also also rotates the EEPROM writes to successive areas in EEPROM to expand the 100,000 write cycles to over 2 million write cycles. These two techniques allow for a design life of 50,000 press hours.

What this means for the user is that when the reloading session is finished, the user should wait a couple of minutes before powering off the Press Monitor. An indicator will show when there is information that needs to be saved, and once the indicator is not present, then it is ok to power off.

It is not critical that this advice is followed; the unit can be safely powered off at any time. The downside to not waiting is that the last couple of rounds or other changed values will not be written.

```
Next --> Push Handle UP and PRIME...
 534 Rnds  1:37 Time  342 RPHc  299 RPHt'
```

The indicator is a blinking apostrophe after the lowercase t in the RPHt statistic. It goes on and off as necessary and can be ignored during use. When any value changes that needs to be written, the indicator blinks until the changes have been written.

If an immediate write is desired, holding down the minus button stops the press timer and writes EEPROM values immediately.

Setup and Diagnostics

```
Entering Setup...
```

Holding down the ignore button for 3 seconds enters setup and diagnostics.

Some options in setup only appear if necessary. For example, Display Options are only prompted for if Press Monitoring is enabled.

```
RESET Press Maintenance?
No                          No [      ] Yes
```

If press maintenance is due; the user will be prompted if they wish to reset it.

```
Are You SURE?
No                          No [      ] Yes
```

Many prompts that reset something are followed up with an Are You Sure? prompt to verify.

```
Re-enable Any Disabled Reminders?
No                          No [      ] Yes
```

If there are any disabled reminders; the user is given an option to re-enable it.

```
Re-enable Voltage Low Reminder?
No                          No [      ] Yes
```

If the user selects yes, then each disabled reminder can be re-enabled.

Setup is divided into sections, with a single question asking if the user wishes to enter that section.

Specify Session Values Section:

```
Specify Session Values?
No                              No [    ] Yes
```

```
Specify Rounds To Load?
Not Specified                   NS [    ] 5000
```

Specify Rounds To Load indicates the number of rounds the user wishes to load. This is an optional setting that if specified calclulates two statistics: remaining rounds (RmRd) and remaining time (RmTm). It will also generated a Specified Rounds All Loaded reminder when all rounds are loaded.

```
Specify Charge Weight?
4.7 Grains                      NS [    ] 500
```

Specify Charge Weight indicates the charge weight of the round being loaded. This is an optional setting that if specified turns on two features. The first feature is the low powder reminder which indicates when the powder measure falls below a specific weight. The second feature allows the user to analyze powder usage at the end of the reloading session to see the actual charge weight put in the cases on average, by detecting how much powder was actually consumed.

```
RESET Current Session?
No                              No [    ] Yes
```

This will reset the current session information as if the user had powered off and back on. All the current statistics will be reset and ready for a new session.

Specify Powder Measure Values Section:

```
Add Powder To Powder Measure?
Yes                           No [|||||||] Yes
```

This section is covered in complete detail in the Powder Measure Features section.

View Or RESET Statistics Section:

```
View Or RESET Statistics?
No                            No [      ] Yes
```

```
1232 Rounds, 3.8 Hours, 324 RPH
                              Press Totals
```

Press Totals will be displayed. The message stays on the display until the ignore button is pressed.

```
RESET Press Totals?
No                            No [      ] Yes
```

RESET Press Totals allows the user to reset these statistics.

```
3000 Rounds Remaining (100%)
0% [|||||||] 100%          Press Maintenance
```

Press Maintenance will be displayed. The message stays on the display until the ignore button is pressed.

```
RESET Press Maintenance?
No                          No ⬜ Yes
```

RESET Press Maintenance allows the user to reset press maintenance.

```
RESET Current Session?
No                          No ⬜ Yes
```

RESET Current Session allows the user to reset the current reloading session as if they turned the unit off and back on again. The round counter and time counters will reset as well as the other statistics.

Change Main Settings Section: (Contains Press, Startup, Display, and Reminder Subsections)

```
Change Main Settings?
No                          No ⬜ Yes
```

Change Press Settings Section:

```
Change Press Settings?
No                          No ⬜ Yes
```

Change Press Settings is covered in the Press Types section above.

Change Startup Settings Section:

```
Change Startup Settings?
No                          No ⬜ Yes
```

```
Display Press Totals At Startup?
Yes                        No ▥▥▥▥ Yes
```

Allows the user to specify whether to display Press Totals at startup when the unit is turned on. This will add 3 seconds to the startup sequence.

```
Display Press Maintenance At Startup?
Yes                        No ▥▥▥▥ Yes
```

Allows the user to specify whether to display Press Maintenance at startup when the unit is turned on. This will add 3 seconds to the startup sequence.

```
Display Power At Startup?
Yes                        No ▥▥▥▥ Yes
```

Allows the user to specify whether to display Power Status at startup when the unit is turned on. This will add 3 seconds to the startup sequence.

```
Ask Specify Rounds To Load At Startup?
Yes                        No ▥▥▥▥ Yes
```

Ask Specify Rounds To Load At Startup enables the prompt at startup when the unit is powered on.

```
Ask Specify Powder Measure At Startup?
Yes                        No ▥▥▥▥ Yes
```

Ask Specify Powder Measure At Startup enables the prompt at startup when the unit is powered on.

Change Display Settings Section:

```
Change Display Settings?
No                              No [____] Yes
```

```
Monitoring Instructions?
Half Line (6 Statistics)        H [____] F
```

Half Line displays the press instructions such as Pull Handle DOWN on half of the top line instead of the entire line. This allows two additional statistics to be displayed on the top line, bringing the total to six instead of the usual four. The press instructions are shorter and lack the priming message in this mode. Full Line uses the entire top line for instructions, but only displayed 4 statistics at one time on the display.

```
Current Statistics View?
1                               1 [____] 4
```

Use this table to determine which statistics are displayed in which views:

Instructions	View	Top Line	Bottom Line
Half	1	PmRd RmTm	Rnds Time RPHc RPHt
Half	2	RmRd RmTm	Rnds Time RPHc RPHt
Half	3	PmGr RmTm	Rnds Time RPHc RPHt
Half	4	PmGr PmRd	Rnds Time RPHc RPHt
Full	1		Rnds Time RPHc RPHt
Full	2		Rnds RmTm RPHc RPHt
Full	3		RmRd RmTm RPHc RPHt
Full	4		PmRd RmTm RPHc RPHt

```
Rotate Statistics View?
2 Seconds                       Off [I▮__] 30s
```

Rotate Statistics View will automatically change the view every so many seconds. With this option off, the user can just use the swap stats button to change views and it will stay in their selected view.

Change Reminder Settings Section:

```
Change Reminder Settings?
No                              No [____] Yes
```

```
Reminder Delay Time?
30 Seconds                      30s [____] 5m
```

Reminder Delay Time is how often reminders occur. The range is from 30 seconds to 5 minutes. Reminders will repeat on this interval.

```
Press Maintenance Reminder?
Yes                             No [|||||||] Yes
```

Press Maintenance Reminder specifies whether press maintenance is currently enabled. Normally this is set to yes, but if a Press Monitor is shared between presses, the user may wish to set this to no on the secondary press so it does not add into the maintenance count for the primary press.

```
Press Maintenance Reminder Type?
By Rounds                       Rnds [____] Hrs
```

Selects whether the user wants to track press maintenance by rounds or by hours.

```
Press Maintenance Amount?
3000 Rounds                     1k [____] 250k
```

Press Maintenance Amount specifies the number of rounds or hours until the press requires maintenance. The range for rounds is 1,000 to 250,000. The range for hours is 10 to 400.

```
Break Reminder?
60 Minutes                          Off ▐IIII  ▌ 120m
```

Break Reminder issues a single reminder to take a break. Unlike all of the other reminders, the break reminder only occurs once and will not occur again until another break is due. The range is Off, or 30 to 120 minutes, in 15 minute increments.

```
RPHc Too Fast Reminder?
1200 Rounds                          No ▐I  ▌ 6450
```

RPHc Too Fast Reminder issues a reminder when the RPHc (RPH of that last 3 to 15 rounds) is above the specified value. The range is Off, or 100 to 6,450 rounds.

```
Powder Low Reminder?
1000 Grains                          Off ▐  ▌ 3500
```

Powder Low Reminder will trigger a reminder when the powder measure falls below the specified value. The range is Off, or 500 to 3,500 grains.

```
Interval Reminder?
Off                                  Off ▐  ▌ 1000
```

Interval Reminder will trigger a reminder everytime this threshold is met. If set to 100 for example, a reminder will be issued at 100, 200, 300, 400, 500, and so on.

```
Automatic Power Profile Change Reminder?
Yes                                  No ▐IIIIII▌ Yes
```

Automatic Power Profile Change Reminder will display a message when the power profile automatically changes.

```
Low Power Reminder?
Below 6.500V                    Off ▐IIIIIII▌ 7.7V
```

Low Power Reminder specifies the voltage that will trigger a low power reminder. The range is off, below 6.300V to below 7.700V.

Enter Diagnostics And Advanced Settings Section: (Contains Input, Error, Power, Light, Test Inputs, Test Outputs, Test LCD, Calibration, and Stopwatch Subsections)

```
Enter Diagnostics And Advanced Settings?
No                              No ▐____▌ Yes
```

Change Input Settings Section:

```
Change Input Settings?
No                              No ▐____▌ Yes
```

```
Input Button Debounce Time?
50ms                      5ms ▐I___▌ 250ms
```

Input Button Debounce Time specifies the amount of time a button input must be stable to change states. For any input, there is a period of time where it is not fully on or off and bounces on and off very briefly. To prevent this from being interpreted as multiple presses or connections, a technique called debouncing is used.

```
Input Sensor Debounce Time?
30ms                      5ms ▐I___▌ 250ms
```

Sensor Debounce Time works the same way except that it specifies the debounce time for the press input sensors.

```
- Button Input
Normally Open (High)          NO [⬜⬜⬜] NC
```

Each of the 8 inputs (5 buttons and 3 sensors) can be configured to set their normal state. They are by default all set to normally open (high) because they are held high by both an internal 30k pull-up resistor and also an external 4.7k pull-up resistor. They go low when connected to ground. If an alternate type of press sensor is used such as an optical or proximity sensor, these options may need to be changed.

Change Error Settings Section:

```
Change Error Settings?
No                            No [⬜⬜⬜] Yes
```

```
Blink Press Light On Error?
Yes                           No [▌▌▌▌] Yes
```

Blink Press Light On Error blinks the press light when in error mode and the buzzer is active. This benefits anyone who is hearing impaired, but is also useful as an additional indicator that an error has occurred.

```
Buzzer Mode On Error?
Pulsed                        Pul [⬜⬜⬜] Sol
```

Buzzer Mode On Error allows the user to select a pulsed (on and off repeating) or solid buzzer (always on).

Change Power Settings Section:

```
Change Power Settings?
No                              No [____] Yes
```

```
Current Power Profile?
Main                         Main [|||||||] Batt
```

Current Power Profile specifies the which power profile is active. This determines which LCD and Press Light Maximum will be used to determine the light brightness which in turn determines power consumption.

```
Automatic Power Profile Change?
Yes                             No [|||||||] Yes
```

Automatic Power Profile Change specifies the whether the power profile will automatically change when one or the other power source is providing 90% or more.

```
Disable Lights On Low Power?
Yes                             No [|||||||] Yes
```

Disable Lights On Low Power Error will automatically turn off the LCD Backlight and the Press Light if the internal voltage drops below 4.7V. These two lights are responsible for over 90% of the power consumption and the microcontroller is capable of turning them off so quickly that it can keep the Press Monitor running on less voltage.

```
Main Low Voltage?
6.60V                            6V [___] 15V
```

Main Low Voltage specifies the low voltage value for the main voltage. This and any voltage below it are considered 0%. The range is 6V to 15V.

```
Main High Voltage?
7.00V                                    6V [▯▮▯] 15V
```

Main High Voltage specifies the high voltage value for the main voltage. This and any voltage above it are considered 100%. The range is 6V to 15V.

```
Battery Low Voltage?
7.20V                                    6V [    ] 15V
```

```
Battery High Voltage?
9.60V                                    6V [▮▮▮ ] 15V
```

Battery Low Voltage and Battery High Voltage work exactly the same way.

Change Lights Settings Section:

```
Change Light Settings?
No                                       No [    ] Yes
```

```
Main LCD Backlight Maximum?
100%                                     0% [▮▮▮▮▮▮▮] 100%
```

Main LCD Backlight Maximum determines the maximum setting for the LCD Backlight when it is on high and main power profile is active. If it is set to 100% and the steps are set to 3, for example, then Off=0%, Low=50%, High=100%. But if the LCD Backlight Maximum is set to 50%, then Off=0%, Low=25%, High=50%. The range is from 0% to 100%.

```
Battery LCD Backlight Maximum?
20%                              0% ▯▮▯ 100%
```

Battery LCD Backlight Maximum determines the maximum setting for the LCD Backlight when it is on high and battery power profile is active.

```
LCD Backlight Steps?
Off Low High                     OO ▐▊▊▊▊▌ OLMH
```

LCD Backlight Steps specifies the pattern the light will go through when the LCD Backlight button is pressed. If can be configured as Off On, Off Low High, or Off Low Medium High.

```
Current LCD Backlight?
High                             Off ▊▊▊▊▊ High
```

Current LCD Backlight specifies the current setting. The LCD Backlight button is normally used to change this setting, but providing this option in setup allows it to be changed in case the LCD Backlight button was not implemented.

The four previous dialogs will repeat for the Press Light as well.

Test Inputs Section:

```
Test Inputs?
No                               No ▭ Yes
```

```
- Button Input
Buzzer Sounds When Active    Off ▭ On
```

```
Ignore Button Input
(+ To Continue)              Off ☐ On
```

The Ignore Button Input uses the plus button to continue to the next input because the ignore button is being tested.

Test Outputs Section:

```
Test Outputs?
No                           No ☐ Yes
```

```
All Outputs Disabled For Tests
```

This message will be displayed indicating that all outputs currently on (notably lights) will be disabled for the duration of the output tests. When output tests are complete, all outputs return to their original settings.
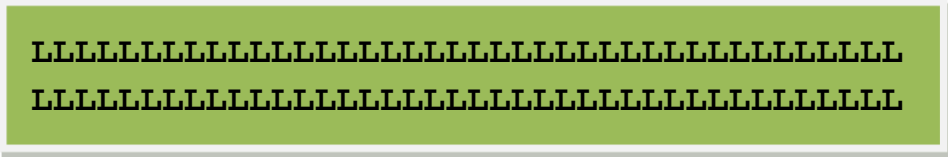
```
Buzzer Output
+ For On, - For Off          Off ☐ On
```

Buzzer Output, LCD Backlight Output, and Press Light Output each have their own prompt similar to this:

Test LCD Section:

```
Test LCD?
No                           No ☐ Yes
```

```
LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLL
```

The L character on the LCD doesn't have the serifs that the above example does, but it is a great place to adjust the contrast of the LCD using a flat blade screwdriver in the hole on the left side of the enclosure. Turning the pot all the way clockwise and then backing off until the horizontal and vertical part of the letter L are similar is the best way to adjust it. Press ignore to continue.
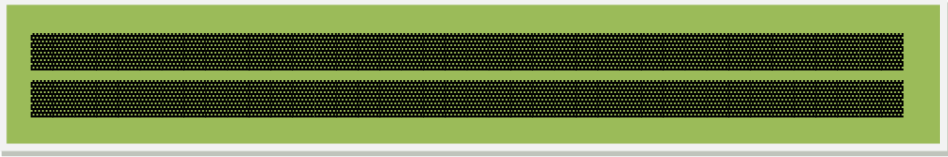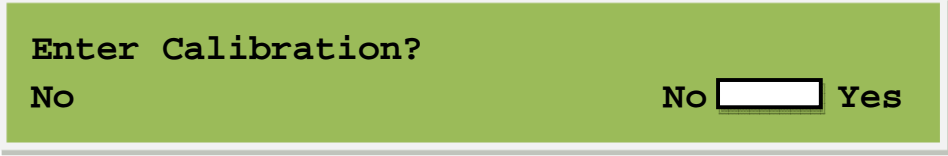
Solid on. Press ignore to continue.

Solid off. Press ignore to continue.

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

The display will now cycle through many characters endlessly. Press ignore to continue.

Enter Calibration Section:

```
Enter Calibration?
No                            No|     |Yes
```

```
Voltage Divider Type?
2                                        1 [====] 2
```

Original units all use Type 1 (10.7K resistors) and newer units will use Type 2 (7.87K resistors). The Type 1 can detect up to 15.631V and the Type 2 can detect up to 20.353V. The only difference in hardware is two of these resistors, both hardware types will accept input voltages up to 20V. The only difference is that Type 1 will be unable to accurately report voltages higher than 15.631V. Units are calibrated before shipping to customers so this setting will be set correctly, but if you do a Clear All Memory, it will assume Type 2 by default unless you change it.

```
Main Calibration              -128 [IIII  ] 127
12.049V, Cal 0
```

Main Calibration, Battery Calibration, and 5V Calibration allow the user to view and calibrate the three monitored voltages. Again, these are calibrated before units are shipped and usually a label is put in the back panel that includes calibration values.

```
Frequency Calibration
8.192000MHz          8.189952 [IIII  ] 8.194047
```

Frequency calibration can be used to adjust for any error with the built in 16.384 Mhz crystal. It might seem odd that the frequency here is exactly ½ of the main crystal, but this is because the maximum clock that can be output is ½ of the main clock. Only when this message is displayed is the test point 5 (TP5) is frequency output enabled. Connect a reliable frequency counter to this test point and measure the frequency and calibrate to it. Again this is normally done to units before shipping to customers on located on the inside of the back cover.

Enter Stopwatch Section:

```
Enter Stopwatch?
No                              No [====] Yes
```

```
Stopwatch
0:00:25.3                              No [    ] Yes
```

Stopwatch is started by + and stopped by -. The rotate sensor on the press will reset the counter. This can be used to verify and test the time accuracy.
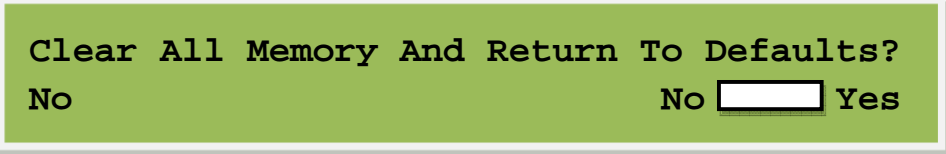
```
Exit Setup and Save Settings?
Yes                                    No [||||||||] Yes
```

The final setup prompt asks the user to exit setup and save settings. Selecting yes will exit and save settings. Selecting No will begin setup again.

Clear All Memory Master Reset

The master reset can be enabled at the first message containing the company name and version by pressing the minus, plus, and ignore buttons at the same time. The display with then prompt the user to clear all memory and return to defaults:

```
Clear All Memory And Return To Defaults?
No                              No         Yes
```

All settings will revert to normal and the user will need to enter all values including calibration values. The calibration values are typically found on a label on the inside of the back cover.

Powder Measure Features

The powder measure features are the most advanced aspects of the Press Monitor so the user should gain a strong understanding of the Press Monitor before using these features.

There is no sensor or input of any type for the powder measure features, so the Press Monitor relies on information provided to it to track powder usage. The user indicates what the charge weight is for the round being loaded so the Press Monitor knows how much powder to remove from the powder measure for each loaded round. In addition, the user also needs to weigh the powder container before putting powder in the measure, and after putting powder in the measure. These before and after weights are used to determine how much powder was added or removed from the powder measure. A larger scale, such as a postal scale, is useful for this process since most reloading scales are limited to a specific number of grains. The Press Monitor accepts measurements in grains, grams, ounces, pounds, or kilograms for the before and after measurements.

Once this information is specified, two features are enabled:

The powder low reminder is straightforward: the amount of powder in the powder measure is monitored and when it falls below a specified number of grains, a powder low reminder is issued. This is useful because not only does it prevent the user from running out of powder, but it also makes sure the powder does not get low enough that it meters differently. The powder level should always be kept above the baffle in the measure for the best consistency.

The powder usage analysis is an optional feature that can be done at the end of the reloading session. The concept is that another before and after weight is taken while emptying the powder measure and the amount of powder returned to the container is compared against how much powder was used for loading the rounds. An error in grains is given along with a percentage and a true calculation of charge weight is reported.

An example of this would be: The user begins by specifying a charge weight of 5.9 grains. Starting with an empty powder measure, the before weight is 23.2 ounces, and the after weight is 5.6 ounces. The press monitor takes the difference (17.6 ounces) and converts it to grains (7,700 grains) and adds it to the powder measure. Then the user loads 310 rounds. 310 * 5.9 should mean that 1829 grains were consumed. The user does another before and after weight while emptying the measure and the before weight is 5.6 ounces and the after weight is 18.9 ounces. The Press Monitor again takes the difference (13.3 grains) and converts it to grains (5819 grains). It then compares the values. 7700 grains - 1829 grains is 5871 grains, but 5819 grains were returned to the powder container. This means that 52 grains are unaccounted for and went into the ammunition resulting in their charge weight being higher than indicated. 52 grains in 310 rounds is a 0.168 grain overcharge and the charge weight of 5.9+0.168=6.068 will be displayed. A 2.84% error will also be reported as this is the percentage of overcharge.
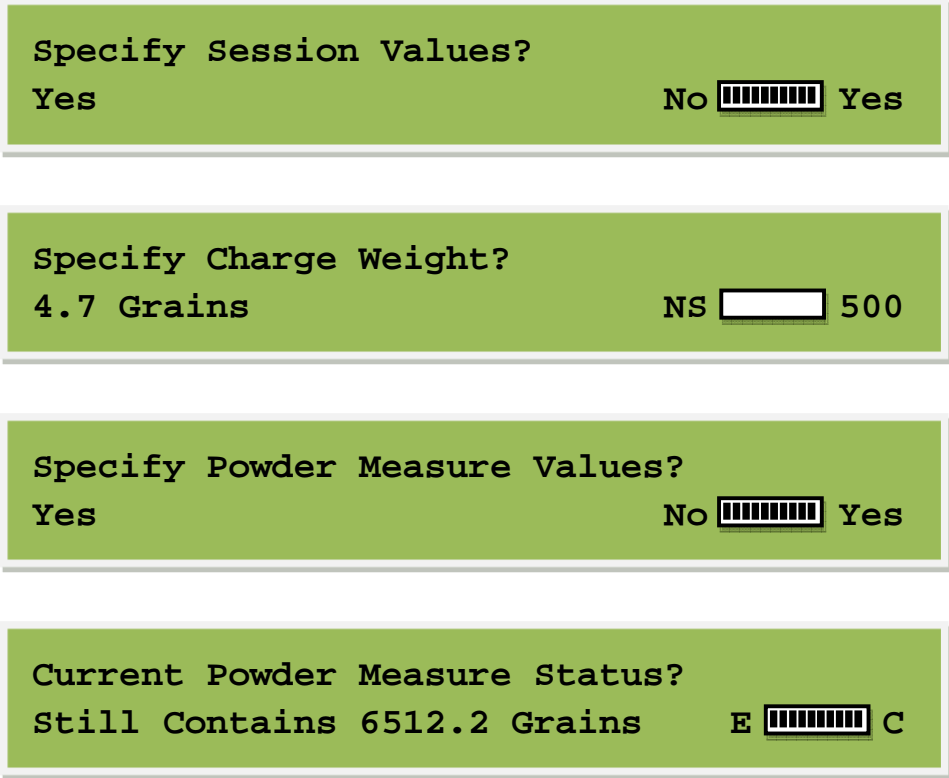
It is a little more work to do a before and after weight twice to get a usage analysis, but the user can be more confident that the powder measure was set accurately. This is also just an extra check to prevent

any sort of major issue such as if the user thought he was loading 4.9 grains, but set the measure to 5.9 grains by mistake. This would show a 20.41% error and would indicate to the user that something was terribly wrong.

The powder in the powder measure and the number of rounds loaded from it are both kept in EEPROM memory, so the user can do a loading session over multiple days and multiple sessions and then take a powder usage analysis at the end to see the results.

One warning is that while changing the charge weight is possible, it is not advised if a usage analysis is desired, because the first load may have been overcharged slightly and the second load may have been undercharged slightly. In this case, the usage analysis may report a low percentage of error because both charge weights could potentially average out to a smaller number.

Begin by setting a charge weight. Nearly all of the powder measure features are disabled if the charge weight is not specified. The user needs to enter setup by holding the ignore button, then selecting yes to enter the specify rounds or charge section, and then setting the charge weight.

```
Specify Session Values?
Yes                              No [||||||||] Yes
```

```
Specify Charge Weight?
4.7 Grains                       NS [      ] 500
```

```
Specify Powder Measure Values?
Yes                              No [||||||||] Yes
```

```
Current Powder Measure Status?
Still Contains 6512.2 Grains      E [|||||||] C
```

If there is powder in the measure from a previous session, the user is given the choice to keep it or indicate the powder measure is empty.

```
Add Powder To Powder Measure?
Yes                        No |||||||| Yes
```

The next question is whether the user wants to add powder to the powder measure.

```
Powder Container Weight Unit?
Ounces                     Gr |||||||| Kg
```

Select the unit of weight that will be used.

```
Powder Container Before Weight?
14.32 Ounces               0 [      ] 160
```

Specify the before weight of the powder container and powder.

```
Powder Container After Weight?
4.11 Ounces                0 [      ] 160
```

Specify the after weight of the powder container with less powder.

```
Are Entered Values Correct?
Yes                        No |||||||| Yes
```

Verify the entered values are correct. If a value was entered wrong, select no and then re-enter it correctly.

```
6295.5 Grains (12 Rounds Loaded)
1256 Rounds Remaining      Powder Measure
```

The powder measure status will be displayed. The upper left shows the current grains in the measure. The upper right indicates how many rounds have been loaded since the measure was filled (required for the usage analysis). The bottom left shows how many rounds can be loaded with this amount of powder. The message stays on the display until the ignore button is pressed.

```
Empty Powder Measure And Analyze Usage?
No                            No [_____] Yes
```

Normally this is the end of the powder questions in setup, but if the user returns to the specify weight again once rounds have been loaded, he will be given the option to empty the powder measure and analyze usage.

```
Powder Container Weight Unit?
Ounces                        Gr [||||||||] Kg
```

The same process of specifying the unit, before, and after weights will occur except that this time the before weight is the powder container before putting powder back in from the measure, and the after weight is after returning the powder to the container from the measure.

```
Powder Container Before Weight?
4.11 Ounces                   0 [_____] 160
```

```
Powder Container After Weight?
11.03 Ounces                  0 [_____] 160
```

```
Error -11.2 Grains (241 Rounds)
Charge Weight 3.805 Grains (1.22%)
```

The usage analysis will be displayed. The upper left shows the error is -11.2 grains. Negative indicates that the powder was short by this amount. If the powder is short, it is because more powder than expected went into the rounds, slightly overcharging them. The upper right shows that 241 rounds were loaded with powder from the measure. Charge Weight of 3.805 grains in the lower left shows the

actual charge weight with the error factored in. The percentage in the lower right (1.22%) indicates an overcharge by 1.22 percent.

Once the user presses ignore, the powder measure is emptied. Normally setup does not save changes instantly, but in this case, the powder measure is emptied and the information is saved immediately. This allows the user to turn the power off right after leaving this message without finishing and exiting setup.

One issue to contend with on the accuracy of this usage is the accuracy of the scale being used. Some larger scales for example are not very good for this purpose because they simply do not offer the accuracy. An example might be a heavy postal scale that can handle up to 40 pounds of weight, but when on the grams setting jumps by 7 gram increments at a time. A 7 gram error is an error of 108 grains. If the user loaded 500 rounds at 8 grains each, the error from the scale alone could be 2.7%. A much better scale choice would be one that could handle the largest powder canister the user plans to load with such as a 5 pound scale that has 1 gram level accuracy.

Firmware Release Log:

Version 1.11:

Interval Reminder

The interval reminder will issue a reminder every so many rounds. The user can set it to disabled or from 5-1000 rounds. If set to 50 rounds for example, it will remind the user at 50, 100, 150, 200, and so on.

Reorganized Setup

Setup has been reorganized to reduce the number of options a user needs to cycle through to make common changes. Reset Session has been moved to View Or Reset Statistics. Powder Measurement Prompts has been merged into Specify Session Values. Error Settings, Change Power Statistics, Change Light Settings have been moved to Diagnostics and Advanced Settings.

Simplified Frequency Calibration

The method to calibrate the clock accuracy has been improved. This is calibrated for the user before the unit is sent out so it is not likely the user would need to recalibrate it. The calibrations are printed out on a sticker on the inside of the back cover so the user can re-enter the values if they have to do a complete EEPROM reset.

To calibrate the clock, a calibrated frequency counter is required. Connect the frequency counter to TP5 if present, or connect to the trace connecting the microcontroller and the LCD Backlight button if TP5 is not present. The LCB Backlight button is normally an input used to tell the microcontroller that the user wants to change the LCD Backlight brightness, but it is overridden during the frequency calibration to provide a 8.192000 Mhz clock. This is why the user can't use the LCD Backlight button to change the LCD Backlight during frequency calibration. The frequency counter will read the frequency and the user needs to adjust the on screen frequency to match the frequency counter. This provides a much greater degree of accuracy than the old method and is much faster to perform.

Version 1.10:

Optional Press Monitoring (Single Sensor Mode)

There are some presses which are mechanically designed to prevent operator mistakes. A Dillon 1050 for example has mechanical short stroke protection. Press Monitoring would still prevent you from not pushing the handle up all the way on a 1050, but that isn't very likely to happen. Prior to this version, the user still needed to mount two sensors, one for when the handle is up and one for when the handle is down. This new feature requires users to only **mount a single sensor** that is used to add a round when tripped. In this case simply connect a single sensor to the rotate input. Another bonus of this mode is that since there are no instructions such as "Pull Handle Down", it will display 8 statistics on the screen all at one time.

More Statistics Displayed

As mentioned above, with Press Monitoring disabled, 8 statistics will be displayed. A new display mode has also been added for when Press Monitoring is enabled allowing 6 statistics to be displayed at one time by shortening the instructions area. This gives the user flexibility in viewing 4, 6, or 8 statistics at one time depending on configuration. When viewing 4 or 6 statistics, the user can still use the swap statistics button to change which are currently displayed.

Improved Statistics

Statistics that do not have a valid value will now show a dash instead of a zero. For example if you have not specified a number of rounds to load the RmRd statistic will show single dash indicating it has no value. All of the statistics now have this feature as well as are protected against values outside of what can be displayed. The round counter for example has room for 0-9999 rounds and it will roll over after 10K back to 0 and continue counting. Other counters like the RPH counters do not roll, but instead will max out at 9999 indicating 9999 or higher. RPHc is now an immediately updated counter and RPHt is now updated every 3 seconds instead of 5 seconds.

Reorganized Setup

Setup has been greatly reorganized to make it more intuitive and reduce the number of questions to next through to exit setup. The user can also independently select whether to be prompted for Charge Weight and/or Powder Measure settings at startup as well.

Support for up to 20V Voltage Detection

A new backup battery system is going to be used which uses 8xAA batteries instead of a 9V battery. This should improve backup battery runtime to 50+ hours instead of 5+ hours. This change forces a higher voltage main power adapter (15V or 18V) to keep the backup battery from being used when wall power is present. A new option in voltage calibration asks which voltage divider type. Original units all use Type 1 (10.7K resistors) and newer units will use Type 2 (7.87K resistors). The Type 1 can detect up to 15.631V and the Type 2 can detect up to 20.353V. The only difference in hardware is two of these resistors, both hardware types will accept input voltages up to 20V. The only difference is that Type 1 will be unable to accurately report voltages higher than 15.631V. Units are calibrated before shipping to customers so this setting will be set correctly, but if you do a Clear All Memory, it will assume Type 2 by default unless you change it.

Sensor Queue

The press sensors are now kept in a queue updated every millisecond instead of waiting for the main loop to poll them for changes. The previous method was plenty fast enough to keep up with press changes, but this new method is bulletproof and can track and report a change every millisecond.

Low Power Error Removed

A low power error will no longer be reported when the internally regulated 5V falls below a configurable threshold. We already have a low power reminder which will alert the user if both

power inputs fall below a settable threshold, so the low power error was a little redundant. It still will turn off the lights (backlight and presslight) within 1 millisecond if the internal voltage drops below 4.7V however.

Smaller EEPROM Needs to be Written Indicator
Previously this indicator was an asterisk displayed on the rightmost character of the top line. Given all the statistics that were added, a place was found that didn't take up an entire character for this indicator so more screen room was available. The indicator now appears as a blinking apostrophe after the letter t in RPHt.

Version 1.08:
Recompile
New compiler features allowed a code size reduction.

Version 1.07:
Improvements to Power Management
I tweaked the voltage calculation forumlas for better averaging and rounding. The microcontroller has 10 bit ADC accuracy which doesn't really lend to a full 3 decimal places so I took all voltage displays to 2 decimal places except the calibration which will remain 3 decimal places. ADC values which provide no useful information to the end user were removed from the calibration feature. I also improved the low power error detection. It took up to 250ms before to detect a low power condition and now it can detect in 1ms. This is important because it can now react to a low power situation and shut down the major power consumers such as the backlight and presslight very quickly if needed to keep itself from shutting down or restarting.

Version 1.06:
Recompile
Development environment has been updated to a new compiler.

Version 1.05:
RESET Current Session Rounds and Time Feature Added
Some users are using the monitor to prepare batches of ammunition and they need a way to reset the current session without powering off and back on. This option is under the RESET Statistics option in setup and properly writes the current statistics to the long term round count and time before clearing the round count and press time.

Code Improvements
While I have not had any reports of issues, I improved the way multi-byte variables are accessed to ensure that their contents are not changed by an interrupt while they are being read.

Version 1.04:
Factory Setup Feature

Before I ship an assembled unit out, I calibrate its voltages and time. The factory setup feature allows me to perform these tasks at startup and still leave the unit powering on asking the user which type of press they are using. The user can go through this process if they like, just do a master reset.

Time Calibration and Stop Watch
The crystal I am using can be plus or minus 4.3 seconds in a 24 hour period. I have added a time calibration feature that allows the user to correct for any inaccuracy. There is also a stop watch now available in setup which can be used to test the accuracy. I will agree that this very small amount of error would hardly be noticeable, but I like things to be accurate so I added this feature to allow a user to calibrate it if they desire.

Code Related Improvements
Not that the user will notice, but the main function used to display information has been replaced with a custom one written to handle integers with a fractional component that I use. This allowed me to simplify several function calls and cut memory usage enough to where I have a several hundred bytes left.

Version 1.03:

Screen Saver
Will randomly display "sleep" on the screen after 60 minutes of inactivity. Should keep the LCD from burning in on a single display if left on for a long time. You can move the press or just press the LCD backlight key a few times to rotate around to the setting you were on to wake it up. It is fully functional and watching inputs during this time.

Round Count has been shortened to Rounds
All prompts that said "Round Count" will now say "Rounds" for simplicity.

Feature To Allow Usage On Multiple Presses
You can turn on or off the Press Maintenance Reminder without losing your current maintenance amount. This was added so someone could use the Press Monitor on two (or more) different presses. You could track maintenance on one of them (the home press), and then hook it up to another press and use setup to (1) change the press type, and (2) disable the press maintenance reminder. Then at some point, return to the original press, set the press type back, and re-enable the press maintenance reminder.

Setup Improvements
View or RESET now each have their own setup section so you can go into each one independently.
The user can use the LCD Backlight and Press Light buttons even on the setting that allows them to set the LCD Backlight or Press Light current value.
The LCD Backlight and Press Light buttons are now disabled during diagnostic input and output testing and will not affect the light settings.

Version 1.02:

Serious Bug Fix: Most Reminders Do Not Work
Only the main voltage low reminder works. This means that battery voltage low, too fast, break, and powder low reminders do not work.

Minor Bug Fix: Maintenance Number of Rounds in Setup Displays Incorrectly
When changing the maintenance number of rounds in setup, it will display odd numbers above 65000. It will work fine, just display wrong.

Active Power Management with Automatic Profile Switching
Active Power Management where it will switch to a main or battery profile automatically. This allows it to reduce power if running on battery without any user intervention. The power display now shows which power source is providing how much power.

Interrupt Based Voltage Checking
The firmware no longer wastes CPU cycles waiting for the result of an analog to digital conversion. This is all handled in interrupts and they are not averaged over a longer period of time making the voltages much more accurate.

Version 1.01:

Remaining Statistics Feature
Simply specify the number of rounds you plan to load and it will add two new statistics:
    RmRd – Remaining Rounds
    RmTm – Remaining Time
You can have it display Rnds/Time, RmRd/RmTm, or Rnds/RmTm.
You can switch between them by holding down the + button for 3 seconds.
Or have them automatically rotate based on a number of seconds configured in setup.

Powder Measure Features
Simply specify the charge weight.
Then add powder to the measure by specifying grains, grams, ounces, pounds, or kilograms, a before weight (powder container+powder).
Then dump however much powder you want into the measure.
Then give it the after weight (powder container with less powder in it now).
It will calculate how many grains of powder you put in the powder measure and keep track of it based on how many rounds you load.
If the powder falls below a threshold set in setup (500-3500 grains), you will get a low powder reminder to add more powder.
You can do so using the same before and after weight
You would need a larger scale such as a small postal scale capable of weighing the powder container with powder obviously.

The second feature of this is a **usage analysis**. When you are done loading, simply take another before and after weight of putting the powder back in its container and the Press

Monitor will analyze how much powder was returned vs what was supposed to be used based on the charge weight and number of rounds loaded. If your charge weight was 5.7 grains and you loaded 323 rounds, it would expect that 1841.1 grains will need to be accounted for. If the before/after weight when returning the powder to its container indicates 1823.5 grains, then you are 17.6 grains short. This means those 17.6 grains went into your loaded rounds, overcharging them by 0.054 grains each. It will display that you are -17.6 grains short along with a percentage, and indicate that the charge weight was 5.754 grains. This may not be a feature everyone is willing to use because it takes a before and after weight and someone might be too lazy to do it, but it provides a nice peace of mind that the powder measure wasn't grossly set wrong such as an entire grain or more off for example.

The powder in the measure (and the rounds loaded from it) are kept between sessions for those of you who are lazy and leave powder in the measure!

Setup has been reorganized and streamlined.
Button Inputs and Sensor Inputs can be set to normally open or normally closed.
Button Inputs and Sensor Inputs can have their debounce time configured in setup.
Press Time Inactivity can be configured in setup.

Improved Input Button Hold
Anywhere where there is scrolling of values, such as holding the plus or minus keys, has been optimized for a auto speed function. The longer you hold the button, the faster it changes it. This makes it easy to get to larger numbers.

Flash Memory Crc Integrity Check
The entire flash memory area is scanned and a crc is calculated at startup. If it is corrupted it will indicate it and halt.

Main Area Button Hold Features
Holding + will switch statistics between normal and remaining (if enabled).
Holding – will stop the press timer and write all unsaved values to EEPROM immediately.
Holding LCDBacklight will show the powder status (grains in measure, rounds loaded, rounds remaining based on grains/chargeweight)
Holding PressLight will show power stauts for main and battery inputs.

Enter Setup without Ignore
You no longer need to go to or from ignore mode to enter setup. Just hold IGNORE and it goes right to setup.

Press Mode Detection
At startup, leaving ignore mode, or leaving setup, your current press mode is autodetected between press down, press up, or down before rotate. This allows more flexibility in resuming press monitoring. When in ignore mode it shows the next mode such as Press Up and you simply press Ignore again to exit ignore mode. If the press is in an invalid mode such as not

down or up, it will say "Unknown Press State" and you will not be able to leave ignore. If you are in "Press Down", but on a 550 you want to be in "Down Before Rotate" simply press + or – in ignore mode and it will change for you.

Version 1.00:
Initial release.