



# **ATM 1-1 Tightening Monitor Operation Manual**



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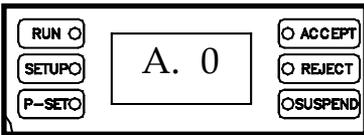
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## Quick Start Guide



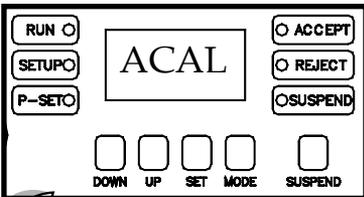
### WARNING:

Be certain appropriate voltage is selected prior to applying power to the unit.



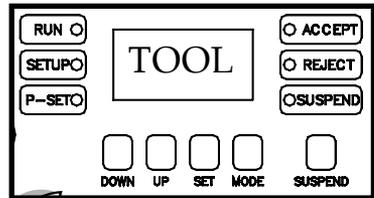
### Step 1:

Power up the unit and wait for the MAIN screen to appear. Once it is in view, turn the key from LOCK to PROG.



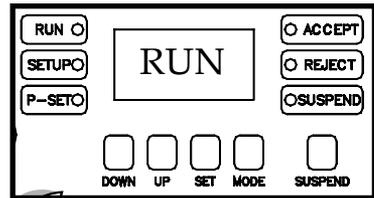
### Step2:

The display will read PROG, MENU and then ACAL. Once the display reads ACAL, press the SET button



### Step 3:

At this point, the display will read TOOL, OFF, PUSH, SET. Make sure the tool and transducer are plugged into the AIM Tightening Monitor and press SET.

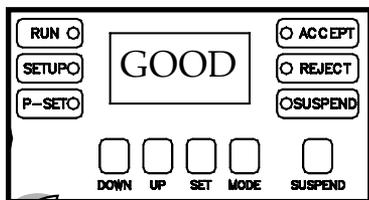


### Step 4:

After SET is pressed, the display will read RUN, TOOL, PUSH, SET. Run the tool on the target fastener allowing the clutch to turn the tool off. Once the clutch has fired, release the trigger on the tool and press the SET button.

*See page 10 for more detailed information on the AutoCal™ process.*

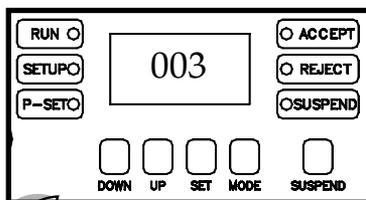
## Quick Start Guide (continued)



### Step 5:

If the calibration was successful, the screen will read ACAL, GOOD, PUSH, SET. Pressing SET at this point will return the ATM to the calibration menu.

If calibration was unsuccessful the screen will read ACAL, BAD, PUSH, SET. Pressing SET at this point will return the ATM to the calibration menu.

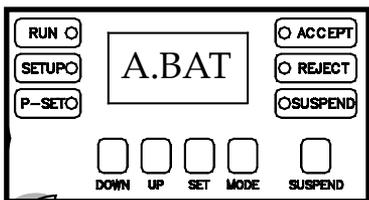


### Step 7:

The display will be showing the number of fasteners in a batch. Use the UP and DOWN buttons to set the flashing digit to the desired value. The SET key to accept the newly programmed value.

The MODE button can be used to exit this phase without programming a batch.

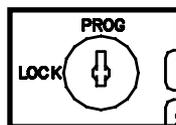
*See page 12 for more detailed information on programming the batch.*



### Step 6:

At the program menu, press the MODE button until the display reads X.BAT (the X will be a letter A-D that represents the current parameter). Press SET in order to program a new "batch" value.

The key can be turned back to the locked position in order to exit the program mode without programming a new batch.



### Step 8:

Turn the key back to the "locked" position.

## Introduction:

Thank-you for your purchase of the AIM Tightening Monitor - (ATM)! We are proud to be included as part of your assembly process.

This document is an operations guide for the AIM Tightening Monitor. The AIM Tightening Monitor can be outfitted to monitor pneumatic tools. By analyzing the analog signature that these tools create, the AIM Tightening Monitor can aid in the manufacturing process by determining if a fastener has been installed properly, and also by counting the number of fasteners that have been installed.

Before using the AIM Tightening Monitor, it is recommended that the user read this manual thoroughly. If this unit is mishandled a fatal accident, bodily injury, or damage to the AIM Tightening Monitor may occur.

This manual is intended to be a general guide to the operations of the AIM Tightening Monitor. If any additional questions or concerns arise, please contact an Aimco representative.



### Warnings:

Do not disassemble the unit for repair or modifications. There is a high electrical voltage inside the unit that could cause electric shock.



Do not allow any type of liquid to come into contact with any part of the unit.



Immediately discontinue use of the unit if smoke, an abnormal odor, or an unusual sound is detected coming from the unit.

### **Warnings (continued):**



Insert all pneumatic fittings fully into their mating receptacles. Failure to do so could result in injury.



Do not fold, bend or apply excessive force to any cable, hose or fitting.

### **Cautions:**

Please use caution when handling this or any other electrical appliance.

The AC power entry can be set to accept 110VAC or 220VAC. Before powering up the unit for the first time, be certain that the voltage selection is appropriate for the power being supplied to the unit.

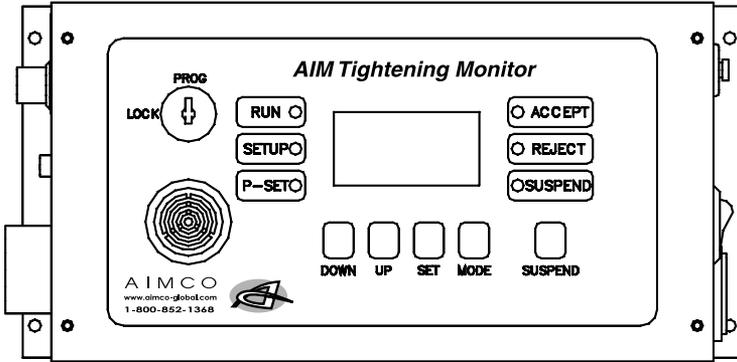
Avoid placing or storing this unit in a location where it may become wet or dust covered.

Do not place or mount this unit in an unstable area. Dropping this unit may result in personal injury or damage to the unit.

Before performing any maintenance on the unit, make sure to turn it off and remove the power plugs.

There are no user serviceable parts inside the main enclosure of the unit.

## Unit Overview



The face of the AIM Tightening Monitor is equipped with buttons labeled DOWN, UP, SET, MODE and SUSPEND. These buttons are used during programming. The MODE button may also be pressed during operation to view different user accessible features. The SUSPEND button can be used to stop and re-start the ATM from monitoring the tool.

Several LEDs (Light Emitting Diodes) also show through the face of the unit. The LEDs give unit statuses. The LEDs functions are as follows:



The RUN LED will illuminate when the tool is “in cycle”.



The SETUP LED will be illuminated when the AIM Tightening Monitor is in program mode.



The PSET LED will be lit when the parameter selection dip-switch is set to select parameters from the rotary knob.



The ACCEPT and REJECT LEDs illuminate to indicate the status from the last fastener tightening cycle.

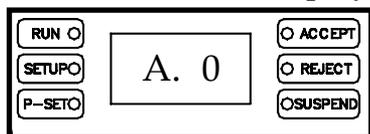


## Unit Overview (continued):



The SUSPEND LED will be lit any time the unit is suspended.

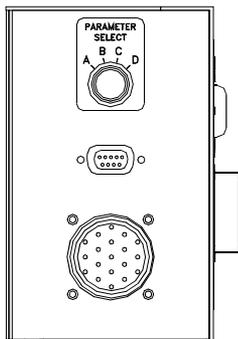
A four character display resides in the center of the AIM



Tightening Monitor's face.

This display gives feedback to the user informing the user of batch counts, totals, and also provides information during the programming phases.

Also located on the front of the unit are a keyswitch and a sonalert beeper. The keyswitch can be used to place the ATM into its programming mode. The sonalert will beep each time a reject occurs. A double-beep can also be programmed to occur upon a batch accept.



The left side of the unit contains a parameter selection switch, a 9 pin D-SUB connector, and a 19 pin circular I/O connector.

The parameter selection switch can be rotated in order to select one of four different parameter sets. Each parameter set can have its own Tmin, Tmax,

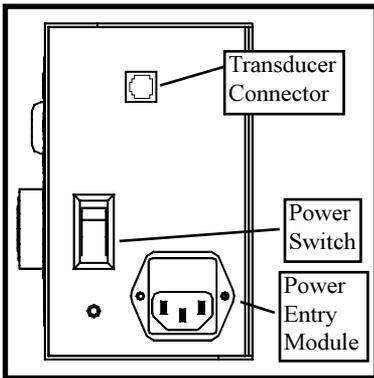
Tclutch, threshold, and batch settings.

The 9-PIN DSUB connector is used as an RS-232 port for communicating with serial devices. Pin two is the RX pin, pin three is the TX pin, and pin 5 is ground.

### Unit Overview (continued):

A 19-pin circular connector is also located on the left hand side of the unit. This connector has several different inputs and outputs and may be used to communicate with other devices like PLCs (Programmable Logic Controllers).

The right hand side of the unit contains the power entry section and the tool port. The power entry module has a removable fuse and a means for selecting the voltage entering the box.



The power entry module can be set to accept either 110VAC or 220VAC for its power. This setting is visible through a small window on the power entry module. **Be certain that the appropriate voltage is selected prior to applying power to the unit!**

The power switch turns the unit on and off.

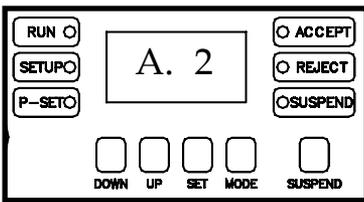
The remote pressure transducer connector (RJ12 - 6 conductor phone) is located on the right side of the box. This connector is designed to provide power to and carry an analog signal back from the remote pressure transducer.

## Monitor Mode:

The ATM has two different modes of operation. These modes are the Monitor mode and the Programming mode. The Monitor mode is the state in which the AIM Tightening Monitor is set to when the key-switch is in the locked position

### Monitor Mode (Individual Count):

By pressing the MODE button the user can select one of several different views within the Monitor mode. After

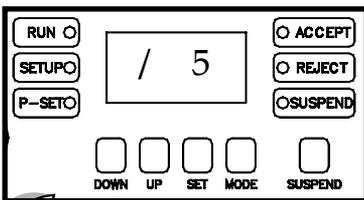


power up the unit will be set to view the count of individual fasteners. Within this view, the display shows the parameter that is in use (A-D) and the

number of fasteners that have been completed towards a batch.

### Monitor Mode (Batch):

If the MODE button is pressed while viewing the Individual Count, the display will read X.BAT where X

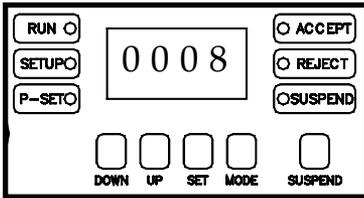


is the current parameter set (A-D). Once the MODE button is released, the display will show the number of fasteners in the batch. The batch can be

set to any number from 1 to 255 in the program mode.

### Monitor Mode (Total):

In order to view the Total, the MODE button should be pressed until the display reads X.TOT. Once again the

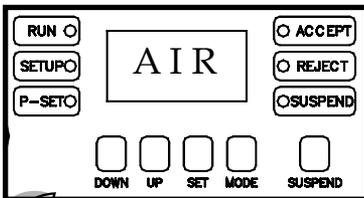


X here is replaced with the current parameter (A-D). Once the MODE button is released, the display will show the number of batches completed.

The total will count up from 0 to 65,535. After reaching 65,535 the counter will roll over to 0. If the value of the total is greater than 9,999 the display will scroll in order to show the entire value.

### Monitor Mode (Type):

Type is the final item that can be viewed from within the



monitor mode. If the MODE button is pressed until the display reads TYPE, when the button is released, the display will give an indication of the

“TYPE” of tool the ATM is set up to monitor.

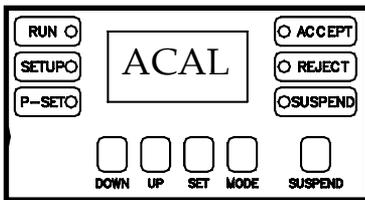
A combination of hardware and software features govern the “TYPE” of tool that a particular ATM can monitor.

## Programming:

In order to effectively monitor any given tool, the AIM Tightening Monitor must first be programmed to recognize the tool. Tool signatures will vary from tool to tool and also from process to process. The first step in setting up any tool should be to perform an AutoCal™.

### Programming (AutoCal™):

The automatic calibration routine is a two step process. The unit first tries to determine if the sensor being employed has an offset while it is at rest. In the second stage of the calibration the unit will look at the analog signature created during a fastening process and it will try to pick the best set of parameters for that process.



In order to enter AutoCal™, insert the key into the unit and rotate it from LOCK to PROG. As the key reaches the program position, the display on the ATM will read PROG, MENU, and then ACAL.

Once the display reads ACAL, press SET. The display will begin to read TOOL, OFF, PUSH, SET. At this point, be certain that the tool and transducer are plugged into the unit. Also, be certain that the tool is off. Then, press SET.

The unit will collect and store the offset. After that process is complete, the unit will begin to display RUN, TOOL, PUSH, SET.

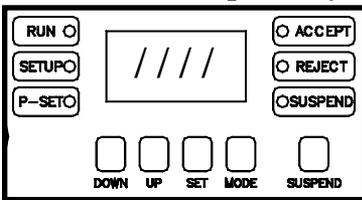
### Programming (AutoCal™) continued:

Once again, make sure the tool is properly connected to the unit. Run a fastener completely from start to finish allowing the tool's clutch to stop the tool. After the clutch stops the tool, release the trigger and then press the SET button.

If the AUTOCAL was good, the display will read ACAL, GOOD, PUSH, SET. The key can be turned back to the locked position in order to exit this routine. Or, SET can be pressed in order to return to the programming menu.

If the AUTOCAL was unable to calibrate the tool, the display will read ACAL, BAD, PUSH, SET. At this point, the key can be turned back to LOCK in order to exit the program mode or SET can be pressed in order to return to the program menu.

In some cases, especially if the tool is ported incorrectly

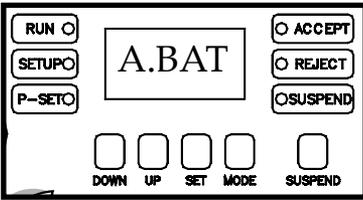


or no signal is reaching the ATM, the display may continue to twirl during the automatic calibration. If this occurs, turn the unit off

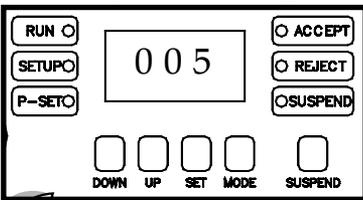
and then back on again. Check the tool port and or the connection to the ATM.

## Programming (Batch):

In order to set the number of fasteners in a batch, turn the key to the PROG position. Press the MODE button until the display reads X.BAT (where X represents the current parameter A-D).



Once at this display, the SET key can be pressed in order to view or program the batch setting. After the SET key has been pressed, the display will show the



current amount programmed into the batch. Also, the digit in the 100's column will be flashing. The UP and DOWN keys can be used in order to

change the value of the flashing digit.

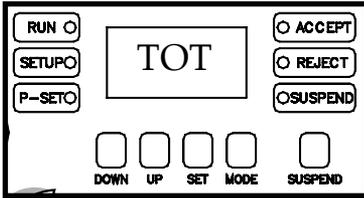
Pressing SET again will lock in the value for the flashing digit and cause the next digit to the right to begin flashing. This process may be repeated until the desired value is programmed into the batch.

Once the final digit is edited, pressing SET will store the batch value into the current parameter set.

Pressing the MODE button at any time will abort the process and take the unit back to the program menu.

The key may also be turned back to the LOCK in order to abort the process and leave program mode.

### Programming (Clearing The Total):



The total number of completed batches is one of the values that can be viewed in the monitor mode. In order to clear this value for any given

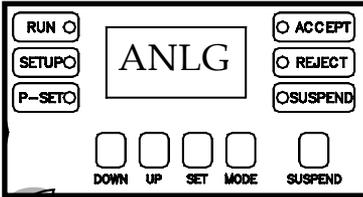
parameter, turn the key to the PROG position and then press the MODE button until the display reads TOT.

If the SET key is pressed while the display is reading TOT, the display will change. A scrolling message which reads "SET CLEARS TOTAL" will appear on the display. If the SET button is pressed at this point, the total number of batches for this parameter set will be cleared.

Pressing the MODE button at any time will abort the process and take the unit back to the program menu.

The key may also be turned back to the LOCK in order to abort the process and leave program mode.

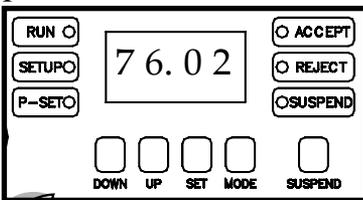
## Programming (Analog Values):



The next item that is available on the program menu is labeled ANLG. This mode allows the user to see the value that is present on both of

the analog channels that the AIM Tightening Monitor possesses. This mode is an excellent trouble shooting tool. To enter this mode, turn the key to the PROG position and press MODE until the display read ANLG.

Once the display reads ANLG, the SET key may be pressed in order to view both of the analog channels.

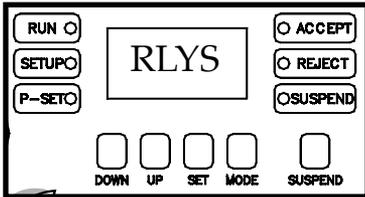


The left two digits on the four digit display will show the analog value for channel 1. The analog value for channel 2 will appear on the right two digits of the display in this mode.

Both values will appear as a percentage of the full-scale value. For example, a pneumatic tool's full scale value is 100 psi. If the left two digits on the display read seventy-six (as the example above does), this would represent seventy-six percent of 100 psi or 76 psi.

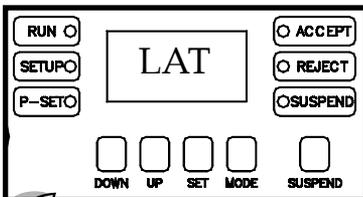
Pressing the MODE button at any time will take the unit back to the program menu.

## Programming (Relays):



Within the AIM Tightening Monitor there are three relays that signal batch accept, cycle accept and reject. These relays can be set to be latching or momentary.

If the relays are set to momentary, each time they are activated, the relay will close for 200 milliseconds and then open back up. If the relays are set to latching, they will close and remain closed until the beginning of the next cycle.



In order to set this value, turn the key to the PROG position and press the MODE key until the display reads RLYS. Once at this display, press the SET button and the display will either read LAT (for latching) or MOM (for momentary).

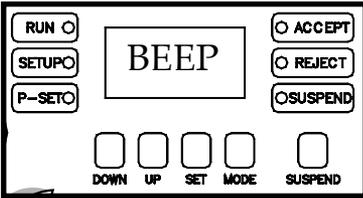
Pressing the SET key will toggle the display between the two values.

Once the desired value is displayed, press the MODE key to escape back to the program menu or turn the key back to the locked position to exit the program mode entirely.

## Programming (Double Beep):

In monitor mode, when a batch is completed, the unit has the ability to let out a double beep to signify that this event has occurred.

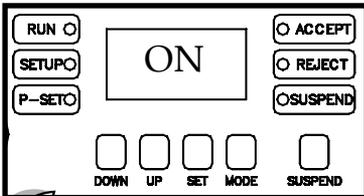
However, the double beep feature is programmable and



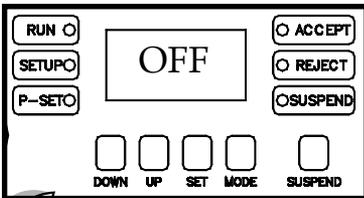
may either be turned on or off in the program mode. To access this setting, turn the key to the PROG position and press the MODE button until

the display reads BEEP.

While the display reads BEEP, press the SET key. After



the SET key is pressed the display will either read “DBL BEEP ON” or “DBL BEEP OFF”. Pressing the SET key will allow the user to toggle between these two values.



Once the desired value is displayed, press the MODE key to escape back to the program

menu or turn the key back to the locked position to exit the program mode entirely.

**Programming (Timers):**

There are three timers that govern the way a AIM Tightening Monitor monitors a fastening process. These timers are timer min (TMIN), timer max (TMAX), and timer clutch (TCLU).

TMIN is the minimum run timer. This timer sets the minimum amount of time the tool has to run prior to the clutch shutting the tool off. This value can be set between 00.00 seconds and 64.99 seconds. In order to function properly, this value should be less than TMAX. During the AutoCal™ process, TMIN will be set to 1/3 the total fastening time on pneumatic tools.

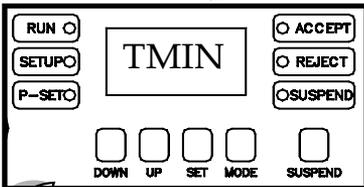
TMAX is the maximum run timer. This timer controls the maximum amount of time that a tool can run prior to the clutch shutting the tool off. This value can be set between 00.00 seconds and 64.99 seconds. During most AutoCal™ processes TMAX is set to be the run-down time plus three seconds.

TCLU is the clutch timer. This value dictates how long the user must hold the trigger after the tool's clutch has engaged. This value can be set between 00.00 and 64.99 seconds. During the AutoCal™ process this value is usually set between 0.1 and 0.05 seconds.

### Programming (Timers continued):

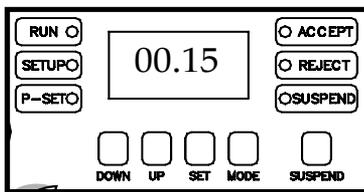
All three of these timers can be adjusted through the program menu. However, there is a software application available that makes this process much easier and much more visual.

In order to adjust one of these timers, turn the key to the



PROG position and press the MODE button until the desired abbreviation is in view (TMIN, TMAX, or TCLU).

Once the abbreviation for the timer that needs editing is in view, press SET. The actual value for the timer will



be visible on the display and the left most digit will be flashing. The UP and DOWN buttons may be pressed in order to edit the flashing digit

to the desired value.

Pressing SET will store the value of the flashing digit and allow the next digit to the right to be edited. Follow this procedure until all of the digits are edited. Upon editing the last digit, when SET is pressed, the new value for the timer will be stored to the current parameter set.

Pressing the MODE button at any time will take the unit back to the program menu. The key may also be turned back to the LOCK in order to abort the process and leave program mode.

**Programming (Thresholds):**

Three thresholds exist within the ATM. These thresholds govern when the unit starts and stops collecting data, when the unit is in cycle, and when the unit determines that the signal is “clutched out”.

Threshold 1 (THR1) acts as a cycle start level for all types of ATMs. When the analog signal on either channel is above THR1, the unit collects that data and stores it in memory. This data is used during the AutoCal™ process or it can also be transmitted via the serial port to an external device for analysis.

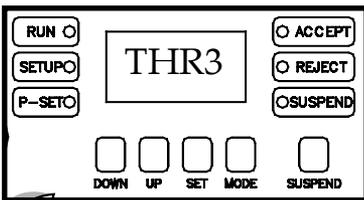
Threshold 2 (THR2) in most ATMs is used to determine when the tool is running. If the analog value rises above THR2, either an accept or a reject is going to be reported when the value falls back below THR2.

Threshold 3 (THR3) is the level at which most tools are considered to be clutched out. When the ATM is set up to monitor pneumatic tools, the tool is considered clutched out when the pneumatic signal rises above THR3.

### Programming (Thresholds continued):

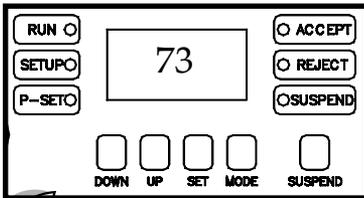
All three thresholds can be adjusted through the program menu. However, there is a software application available that makes this process much easier and much more visual.

In order to adjust a threshold's value, turn the key-switch to PROG and press the MODE button until the



desired threshold abbreviation is in view (THR1, THR2, or THR3). While the threshold abbreviation is on the display, press the SET button.

After the SET button is pressed, the value for the thresh-



old will appear on the display with the left most digit flashing. The UP and DOWN buttons may be employed to adjust the flashing digit. Once

the digit is at the desired value, the SET button may be pressed and the second digit will begin to flash.

After editing the second digit, pressing SET will store the new threshold value to the current parameter set.

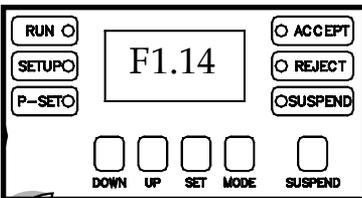
Pressing the MODE button at any time will take the unit back to the program menu.

The key may also be turned back to the LOCK in order to abort the process and leave program mode.

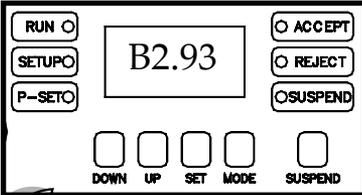
## Programming (Firmware Versions):

The final two elements in the program menu are the firmware versions. There are two microcontrollers inside the AIM Tightening Monitor (on the front board and one on the back board).

Over time, new code releases may be issued to add customer requested functionality or to fix an occasional bug. If new firmware is released, it is given another version number.



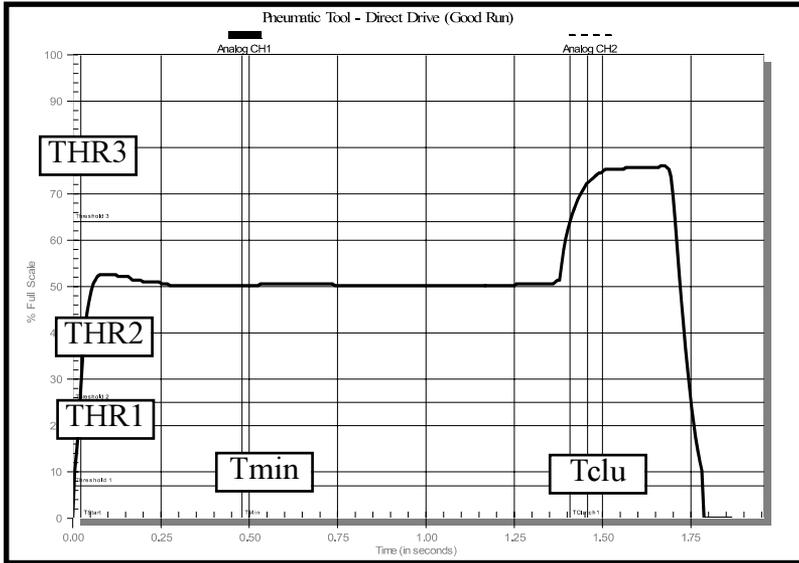
To determine the firmware versions that are running in any given AIM Tightening Monitor, turn the key to PROG and press the MODE button until the display read FX.XX or BX.XX.



In the examples to the left, F1.14 stands for front-board firmware version release number 1.14. The B2.93 stands for back-board firmware version release number 2.93.

## Examples:

The following examples were captured using the AIM Tightening Monitor and the Cyber Q software.



### Direct Drive Pneumatic Tool:

The pneumatic signature was downloaded from a AIM Tightening Monitor that was monitoring a pneumatic direct drive tool. The analog curve has two distinct phases; the run-down phase, and the clutch out phase. If either of the phases were to be missing (or too short as determined by a timer), the fastening cycle would be considered a reject.

During the run-down portion of the curve (prior to the fastener seating), the analog value is at roughly 50% (or 50 psi). After the fastener seats and the clutch turns the tool off, the pressure rises up to roughly 75% (or 75 psi).

**Examples(Pneumatic Direct Drive continued):**

In order to properly qualify this process, THR1 is set around 7 psi. So, once the pressure rises above 7 psi, the ATM starts collecting data. Once the pressure drops back down below 7 psi, the ATM stops collecting data.

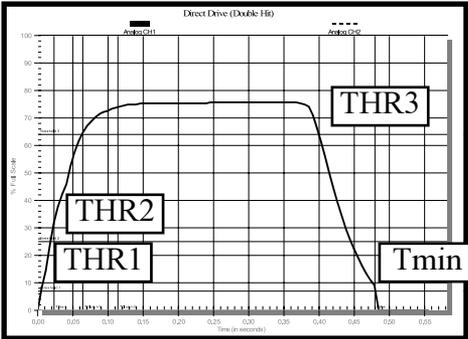
THR2 in this example is set to 25 psi. Once the pressure rises above 25 psi, the ATM considers the tool to be running and will either give an accept or some form of reject at the end of the cycle.

THR3 is set to approximately 65 psi in this example. That value is both greater than the run down value of 50 psi and well below the shut off pressure of 75 psi.

TMIN governs the minimum amount of time that the pressure must be in the run-down phase prior to clutching out.

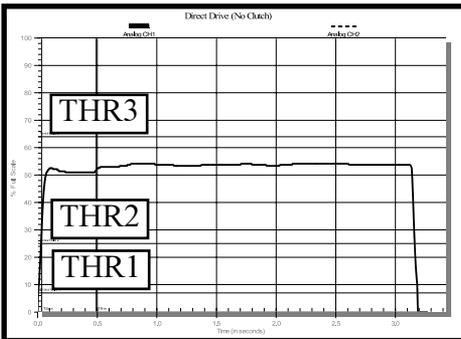
TMAX governs the maximum amount of time that the pressure can be in the run-down phase prior to the clutch shutting the tool off.

TCLU sets the minimum amount of time that the pneumatic signal has to be above THR3 after the clutch shuts the tool off.



### Example (Direct Drive Double Hit):

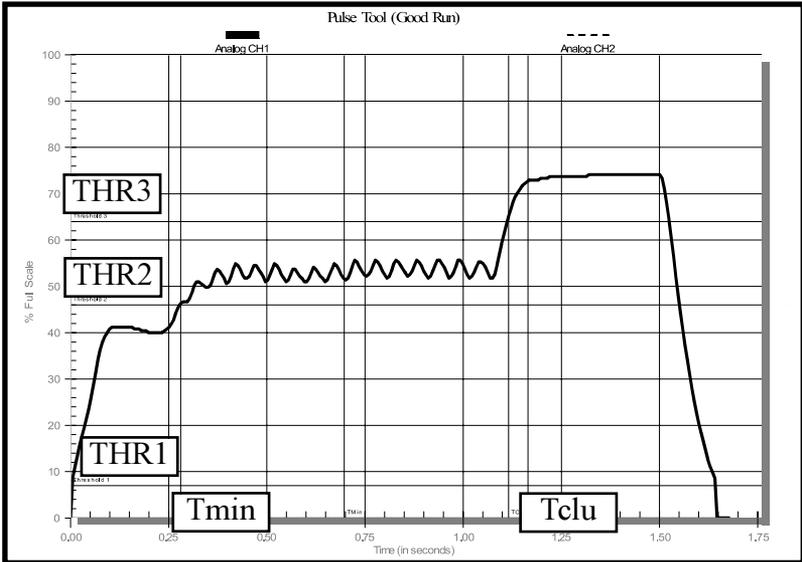
In the example above, a direct drive pneumatic tool was used to re-tighten a fastener that had previously been tightened. In this curve no run-down phase exists. The clutch immediately turns the tool off and therefore TMIN is violated. A reject occurs upon the completion of a run like this one.



### Example (Direct Drive No Clutch):

In the example above, a direct drive pneumatic tool was not allowed to tighten its fastener completely. The process was stopped prior to the tool clutching out and therefore the pressure never rose above THR3. TCLU was violated and a reject occurred

## Examples (Pneumatic Pulse Tool):



The example above is a curve from a pneumatic pulse type tool. This curve has three phases. The first phase is the run down of the fastener prior to the head of the fastener seating. This initial phase occurs around 40 psi. The second phase of this fastening process is the pulsing phase. The pulsing phase occurs around 53 psi. During this phase, the tool is incrementally adjusting the fastener's torque slightly upward. The final phase occurs when the clutch shuts the tool off and the pressure rises to approximately 74 psi.

THR1 in this example has been set to about 7 psi. This is the point at which data collection will start and stop.

THR2 sets the point at which the tool is considered on. After the pressure rises above this threshold, either an accept or reject will be generated upon the completion of the fastening sequence

In this example, THR2 is set between the run-down phase and the pulsing phase. THR2 could be set below the run-down phase, however, a reject will be generated each time the trigger on the tool is pulled.

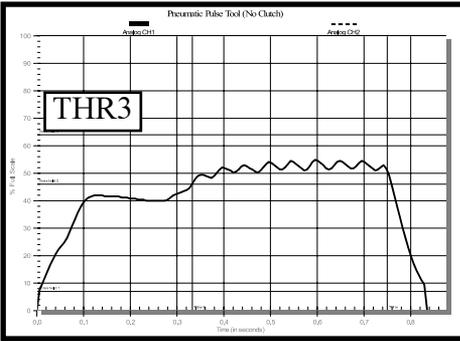
If THR2 is set between the run down phase and the pulsing phase, the tool will have to pulse before any status (such as an accept or reject) is generated.

THR3 is set between the upper peaks of the pulsing phase and the shut-off pressure. Once the pressure rises above this level, the tools is considered clutched out.

TMIN governs the minimum amount of time that the pressure must be in the run-down phase prior to clutching out.

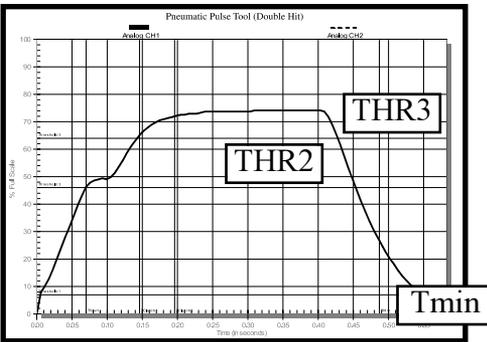
TMAX governs the maximum amount of time that the pressure can be in the run-down phase prior to the clutch shutting the tool off.

TCLU sets the minimum amount of time that the pneumatic signal has to be above THR3 after the clutch shuts the tool off.



### Example (Pulse Tool No Clutch):

In the example above a pneumatic pulse tool was not allowed to tighten its fastener completely. The process was stopped prior to the tool clutching out and therefore the pressure never rose above THR3. TCLU was violated and a reject occurred



### Example (Pulse Tool Double Hit):

In the example above a pneumatic pulse tool was used to re-tighten a fastener that had previously been tightened. This curve spends a very brief period between THR2 and THR3 (the run-down phase). The clutch immediately turns the tool off and therefore TMIN is violated. A reject occurs upon the completion of a run like this one.

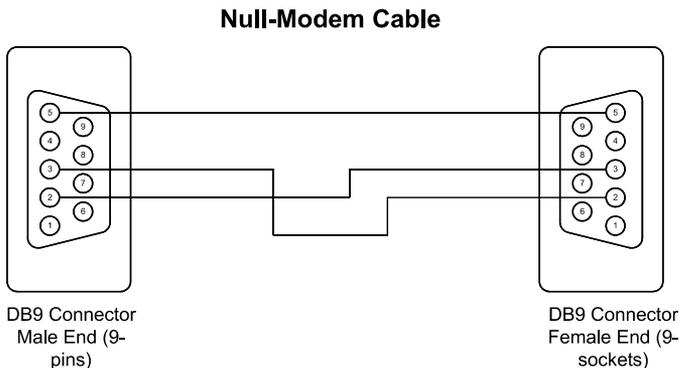
## I/O (RS-232):

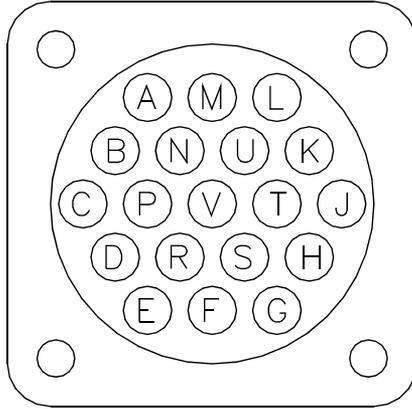
Below the parameter selection knob is a 9-pin D sub-miniature connector. Through the use of this connector and a NULL MODEM cable (see diagram below), a computer or another serial device can communicate with the AIM Tightening Monitor.

Pin 2 on this connector is the RX or receive pin. Pin 3 is the TX or transmit pin. Pin 5 is at ground potential. The ATM communicates asynchronously through this port at 9600 baud using an 8 bit, no parity, one stop bit structure.

A windows based program is available for communicating with the AIM Tightening Monitor. This program may simplify the set-up and the adjusting of parameters.

A document specifying the serial protocol that the AIM Tightening Monitor speaks is available upon request from Aimco or one of their agents.

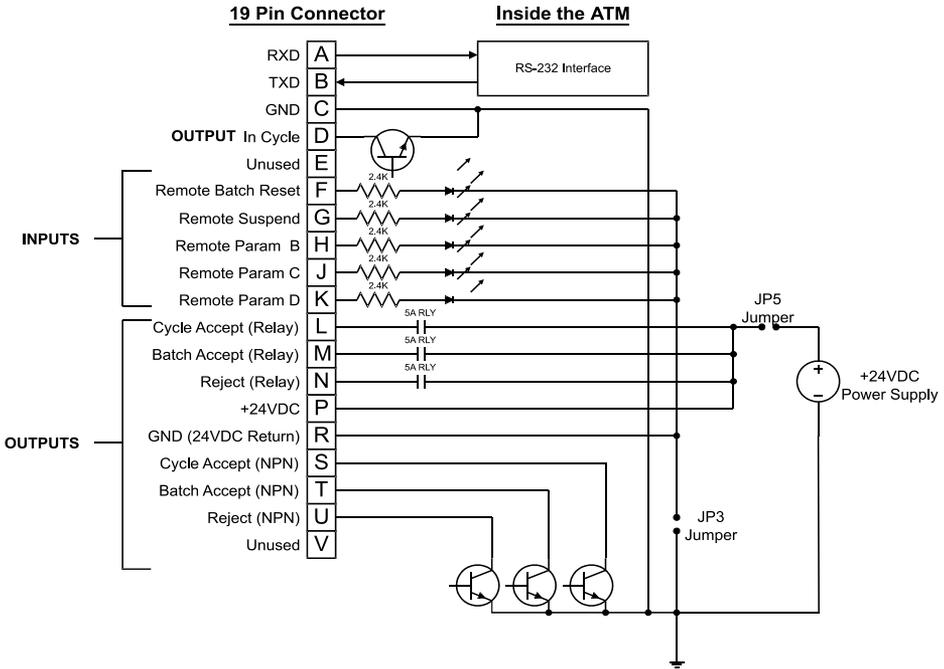




**I/O (19-Pin Connector):**

<b>PIN</b>	<b>FUNCTION</b>	<b>WIRE COLOR</b>
A	RX (RS-232)	Black
B	TX (RS-232)	White
C	GND	Red
D	IN CYCLE (NPN OUT)	Green
E	UNUSED	Orange
F	BATCH RESET (OPTO IN)	Blue
G	SUSPEND (OPTO IN)	White/Black
H	PARAM B SELECT (OPTO IN)	Red/Black
J	PARAM C SELECT (OPTO IN)	Green/Black
K	PARAM D SELECT (OPTO IN)	Orange/Black
L	CYCLE ACCEPT (RLY OUT)	Blue/Black
M	BATCH ACCEPT (RLY OUT)	Black/White
N	REJECT (RLY OUT)	Red/White
P	RELAY COMMON (+24VDC OUT)	Green/White
R	OPTO COMMON (GND)	Blue/White
S	CYCLE ACCEPT (NPN OUT)	Black/Red
T	BATCH ACCEPT (NPN OUT)	White/Red
U	REJECT (NPN OUT)	Orange/Red
V	UNUSED	Blue/Red

## I/O (19-Pin Connector continued):



JP3 and JP5 on this diagram can be found on the back-board (CE2891) inside the AIM Tightening Monitor.

Installing JP5 connects the 24VDC internal power supply from the relay common (PIN P). With JP5 disconnected, a user supplied voltage can be placed on PIN P and that voltage (instead of the internal 24VDC) will be returned on pins L, M and N when the relays close.

Installing JP3 will make inputs F-K common with the system ground. Removing JP3 lifts the ground reference for pins F, G, H, J, K and R. A user supplied ground reference can then be placed on pin R in order to use the inputs on pins F, G, H, J, K.

**Dip-Switch:**

Inside the ATM there are two circuit boards. One of the circuit boards is attached to the front panel and the other to the back panel.

Both circuit boards have eight position dip-switches on them. The dip-switch on the front board is reserved for factory use only.

The dip-switch on the back board has a couple of user functions. Position 1 determines where parameters are being selected. If position 1 on the dip-switch is on, parameters are selected via the parameter switch. If position 1 is off, parameters may be selected through the 19-pin connector.

Position 7 on the back board controls the sonalert on the front of the unit. If this dip-switch is on, the beeper will work. If not, the beeper is silenced.



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