AcraDyne®
A Division of AIMCO

Gen IV iEC4W, iEC4W1, iEC4W2, iEC4WF Controller Operation Manual

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1. Safety Information

General Power Tool Safety Warnings

WARNING

Read all safety warnings, instructions, illustrations, and specifications provided with this power tool. Failure to follow all instructions listed below may result in electric shock, fire, and/or serious injury.

Save all warnings and instructions for future reference.

1. Work area safety

a. Keep work area clean and well lit.

b. Do not operate power tools in explosive atmospheres, such as in the presence of flammable liquids, gases, or dust.

c. Keep children and bystanders away while operating a power tool.

2. Electrical safety

a. Power tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs with earthed (grounded) power tools.

b. Avoid body contact with earthed or grounded surfaces, such as pipes, radiators, ranges, and refrigerators.

c. Do not expose power tools to rain or wet conditions.

d. Do not abuse the cord. Never use the cord for carrying, pulling, or unplugging the power tool. Keep cord away from heat, oil, sharp edges, or moving parts.

e. When operating a power tool outdoors, use an extension cord suitable for outdoor use.

f. If operating a power tool in a damp location is unavoidable, use a residual current device (RCD) protected supply.

3. Personal safety

a. Stay alert, watch what you are doing, and use common sense when operating a power tool. Do not use a power tool while you are tired or under the influence of drugs, alcohol, or medication.

b. Use personal protective equipment. Always wear eye protection.

c. Prevent unintentional starting. Ensure the switch is in the off-position before connecting to power source and/or battery pack, picking up or carrying the tool.

d. Remove any adjusting key or wrench before turning the power tool on.

e. Do not overreach. Keep proper footing and balance at all times.

f. Dress properly. Do not wear loose clothing or jewelry. Keep your hair, clothing, and gloves away from moving parts.

g. Do not let familiarity gained from frequent use of tools allow you to become complacent and ignore tool safety principles. A careless action can cause severe injury within a fraction of a second.

4. Power tool use and care

a. Do not force the power tool. Use the correct power tool for your application.

b. Do not use the power tool if the switch does not turn it on and off.

c. Disconnect the plug from the power source and/or remove the battery pack, if detachable, from the power tool before making any adjustments, changing accessories, or storing power tools. Such preventive safety measures reduce the risk of starting the power tool accidentally.

d. Store idle power tools out of the reach of children and do not allow persons unfamiliar with the power tool or these instructions to operate the power tool. Power tools are dangerous in the hands of untrained users.

e. Maintain power tools and accessories. Check for misalignment or binding of moving parts, breakage of parts, and any other condition that may affect the power tool's operation. If damaged, have the power tool repaired before use. Many accidents are caused by poorly maintained power tools.

f. Use the power tool, accessories, and tool bits, etc., in accordance with these instructions, taking into account the working conditions and the work to be performed. Use of the power tool for operations different from those intended could result in a hazardous situation.

g. Keep handles and grasping surfaces dry, clean, and free from oil and grease. Slippery handles and grasping surfaces do not allow for safe handling and control of the tool in unexpected situations.

5. Service

a. Have your power tool serviced by a qualified repair person using only identical replacement parts. This will ensure that the safety of the power tool is maintained.

6. Equipment Installation, Operation, and Maintenance

a. Safety of any system incorporating the equipment is the responsibility of the system assembler

b. Position the equipment so that it is easy to access the disconnecting device

c. Do not replace main power cord with an inadequately rated cord

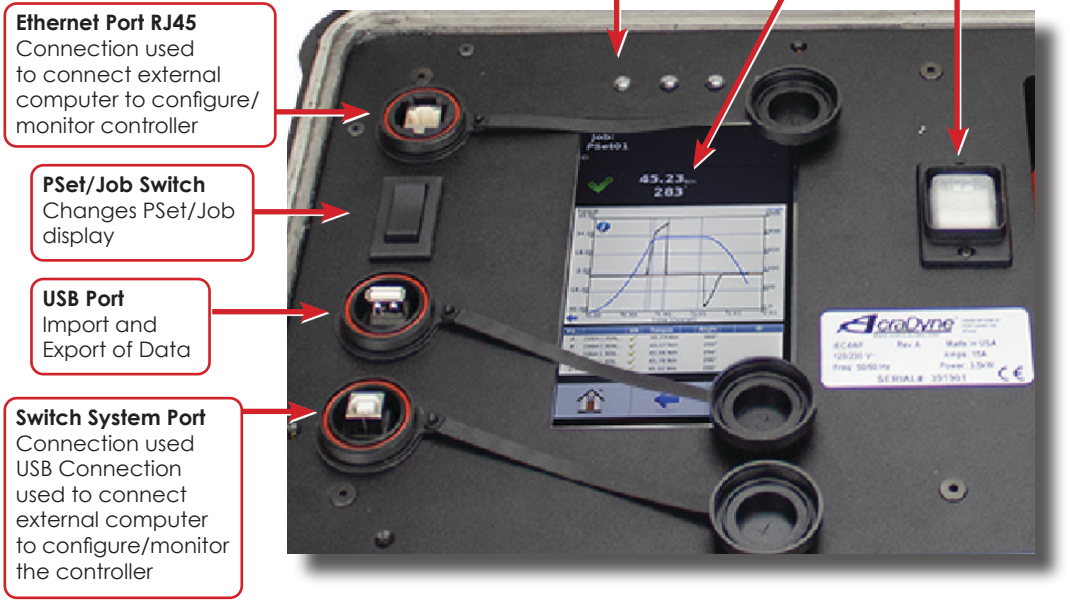
d. Only allow your power tool to be repaired by a qualified technician using only original spare parts, available from AIMCO. This ensures that the safety of your device is maintained.

2. Controller Diagram

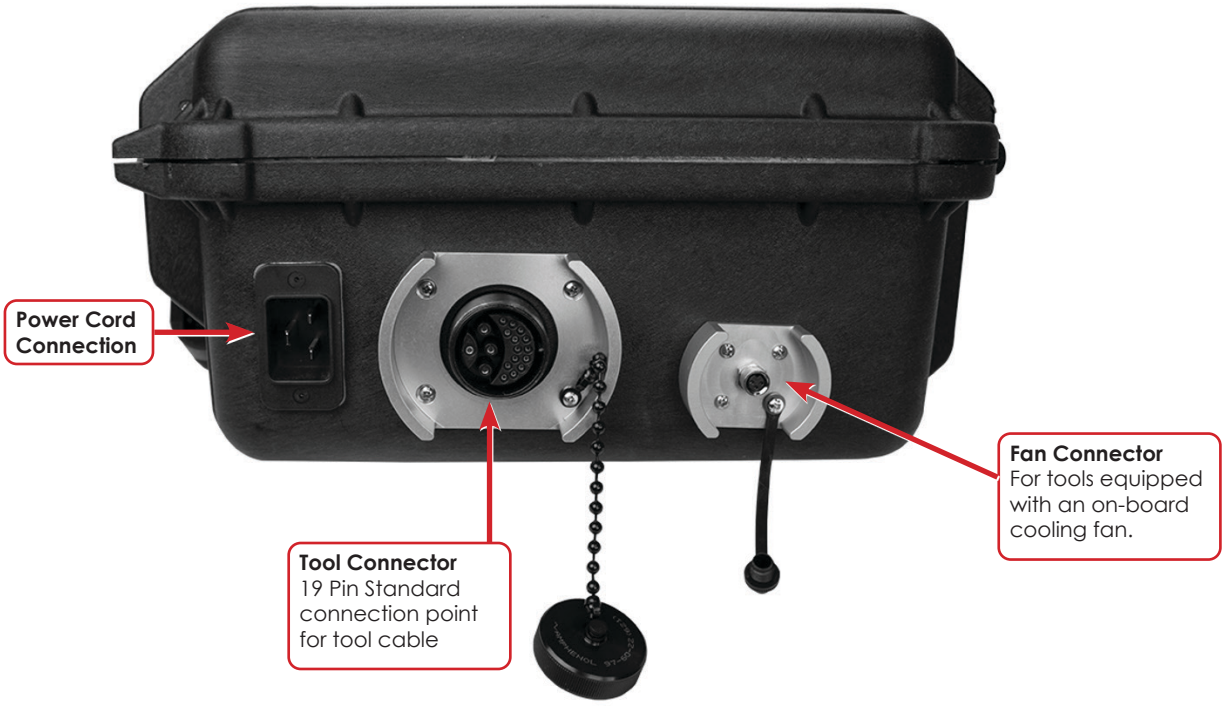
2.1 Front Panel

LED Indicator Lights

Green	Indicates fastening cycle meets specified parameters.
Red	Indicates fastening cycle rejected for exceeding high torque.
Red Flashing	Indicates low torque. Fastening cycle was rejected for not achieving low torque.
Yellow	Indicates High Angle. Fastening cycle was rejected for exceeding high angle.
Yellow Flashing	Indicates Low Angle. Fastening cycle was rejected for not achieving low angle.
Blue	Tool is In-cycle, above threshold.



2.2 Side View



3. Initial Setup

Step 1: Connect tool cable to Tool Connector. AcraDyne recommends not exceeding 20m length of cable. Cable consists of a male pin set housed in a molded 19 pin connector with a polarizing notch. Align tool cable notch with tool connector notch on the controller and insert cable. Securely thread connector coupler to controller body.

Step 2: Repeat above process to connect tool cable to AcraDyne tool being used with the controller.

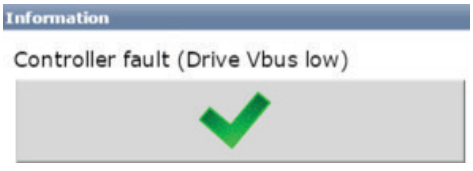
Step 3: Plug female end of power cable into Power Cable Connector.

Step 4: Plug male end of power cable into appropriate power source.

Due to a variety of 230VAC power outlets, the standard power cable plug-end provided with the controller may need to be modified in order to connect to local 230Vac power outlets. AcraDyne has a wide variety of country-specific power cord options available. Check with your authorized AcraDyne representatives to see if your specific configuration is available. In any case, connection to local power should be made in consultation with a qualified electrician.

Step 5: The Redundant Earth Ground needs to be clamped properly to ground.

Step 6: Turn controller on by pushing the Power Disconnect Switch to the POWER ON position, a light indicates power on.



NOTE: Warning will appear if the controller is power cycled too quickly. If fault appears, Power Down controller, wait a minimum of 10 seconds between controller Power Down and Power Up to clear error and restart controller.

3.1 Connecting to the Controller

There are three ways to program/communicate with the controller:

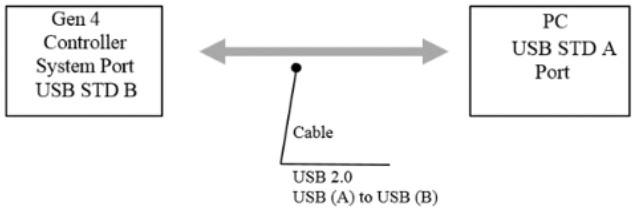
- Controller touch-screen console
- System Port: (USB connection) Direct connection to controller.
- Ethernet Port: Via direct connection or LAN.

Touchscreen Console

Controller functions and programming can be accessed directly through the touch-screen.

1. Power on controller.
2. Run screen will appear
3. Controller is ready for use.

Connecting via the System Port Directly to PC



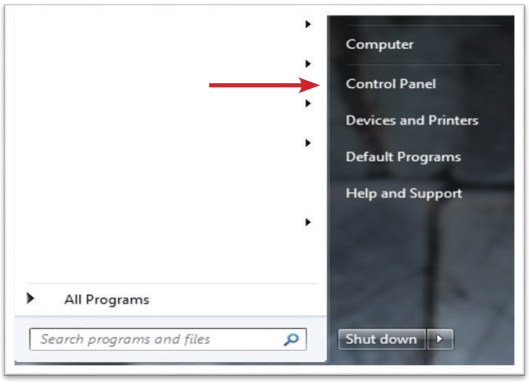
The following is an example using Window 7. Your screen may look different depending on the operating system.

Windows USB Setup

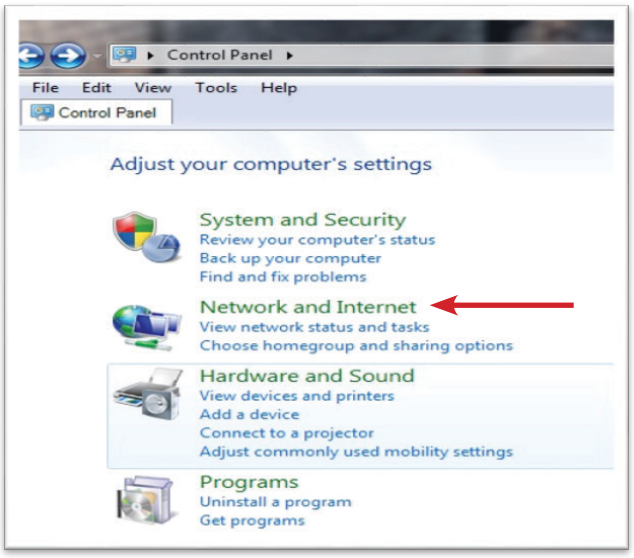
Step 1: Power on PC and controller, allow enough time for them to become fully operational.

Step 2: Attach controller to PC using a USB 2.0 A-B cable. If this is the first time connecting the devices, wait for Windows to install the RNDIS driver. This should happen automatically.

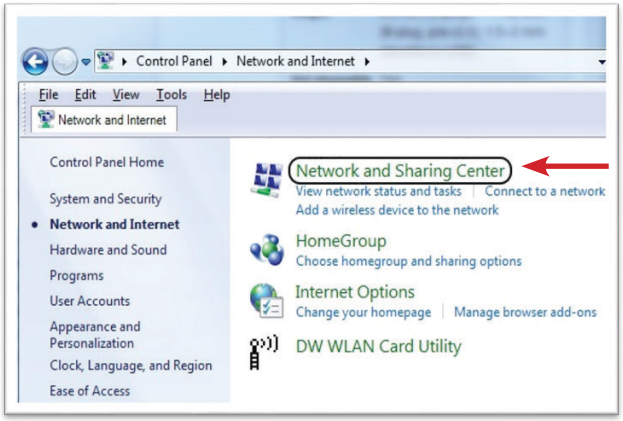
Step 3: After the driver is installed, go to 'Control Panel'.



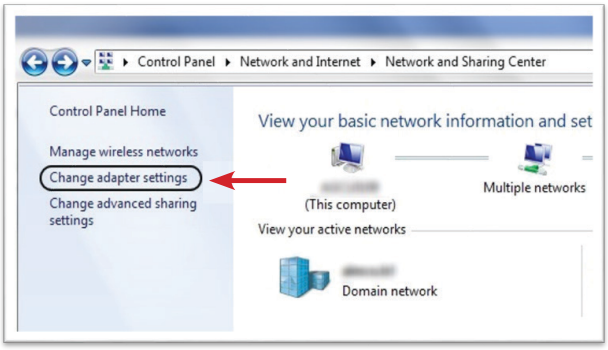
Step 4: Go to 'Network and Internet'.



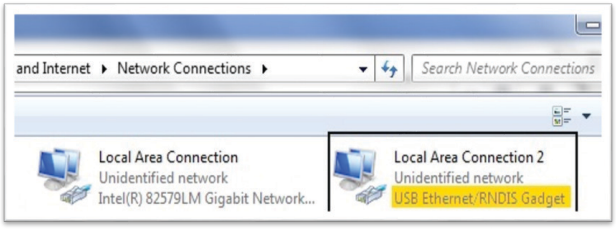
Step 5: Go to 'Network and Sharing Center'.



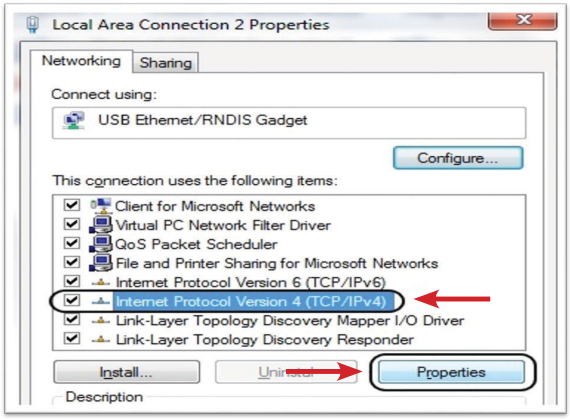
Step 6: Go to 'Change adapter settings'.



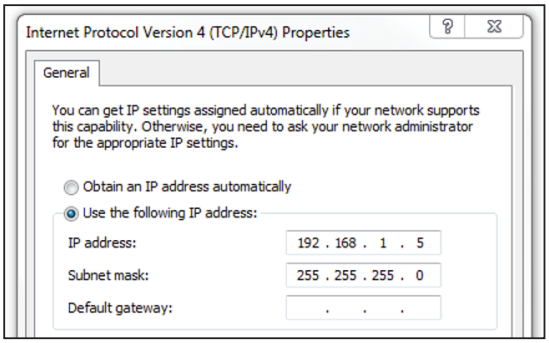
Step 7: Find the Local Area Connection that is using the 'USB Ethernet/RNDIS Gadget' network. Right click this network and go to 'Properties'.



Step 8: In Properties window select 'Internet Protocol Version 4' and click 'Properties'.

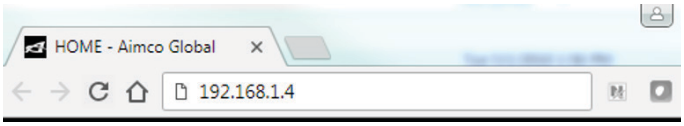


Step 9: In 'Properties', set the IP address to a static address.



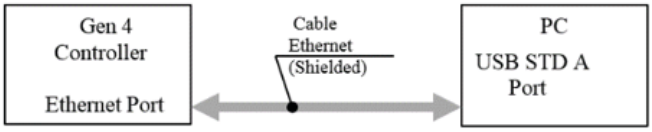
Type an IP address of 192.168.1.5 (Any address on the same subnet as the controller will work). Set subnet mask to 255.255.255.0

Step 10: To connect to the controller, open a browser such as Chrome or Firefox. Enter 192.168.1.4, the default system port IP address.



You will see the controller software on your computer screen.

Connecting using the Ethernet Port Directly to PC



Step 1: Make a physical connection from the PC to the controller's Ethernet (1) port using an ethernet cable.

Step 2: Verify the controller's Ethernet (1) IP address by using the touchscreen or a system port browser session and going to Controller → Communication Interfaces → Ethernet. For controllers that have an LED display, the IP address can also be found by using the toggle button to show it on the secondary LED display.

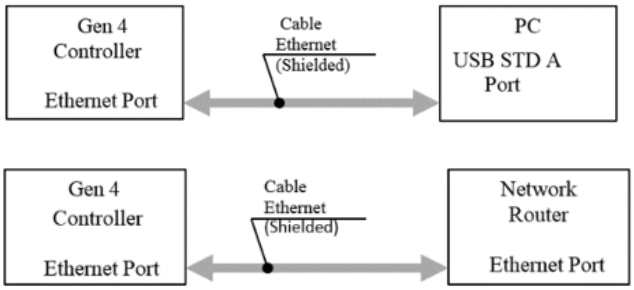
Step 3: If the controller's IP address has not been configured, set the IP address to 10.10.30.99, the Subnet Mask to 255.255.255.0, and the Gateway to 0.0.0.0.

Step 4: Set the static IP address of the PC to 10.10.30.98 and subnet mask to 255.255.255.0. (For instructions, see the example in "Step 9" earlier in this section.)

Step 5: To connect to the controller, open a browser such as Chrome or Firefox and navigate to the controller's Ethernet address.

If the connection is successful the controller's run screen will be displayed in the browser.

Connecting using the Ethernet Port Directly or via LAN to PC



Step 1: Make a physical connection from controller's Ethernet (1) port to a network router connected to the LAN using an ethernet cable.

Step 2: Verify the controller's Ethernet (1) IP address by using the touchscreen or a system port browser session and going to Controller → Communication Interfaces → Ethernet. For controllers that have an LED display, the IP address can also be found by using the toggle button to show it on the secondary LED display.

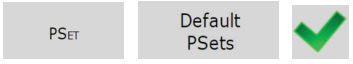
Step 3: If the controller's IP address has not been configured, consult your Network Administrator for selecting a correct IP address, Subnet Mask, and Gateway for your network.

NOTE: Controller does not have a DHCP client, it will not automatically configure itself with a usable IP address.

Step 4: To connect to the controller, open a browser such as Chrome or Firefox and navigate to the controller's Ethernet address.

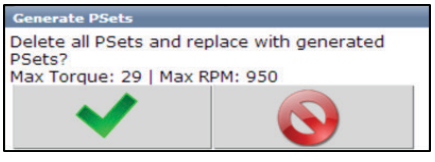
If the connection is successful the controller's run screen will be displayed in the browser

3.2 Quick Set Up (Default PSets from Tool)

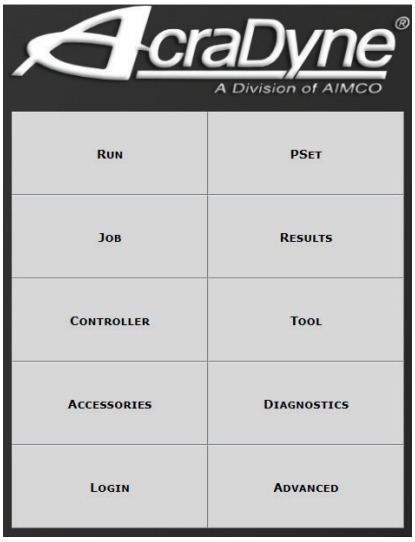
On the Home Page press 

to accept default PSet Parameters:

This will generate three generic PSets for the tool connected to the controller. It will automatically use the 40%, 60%, and 80% of the rated maximum torque of the tool in a two-stage Torque Control Strategy (TC). A prompt will display rated Max Torque and Max RPM of the connected tool for reference. These Psets can be modified to meet application requirements.

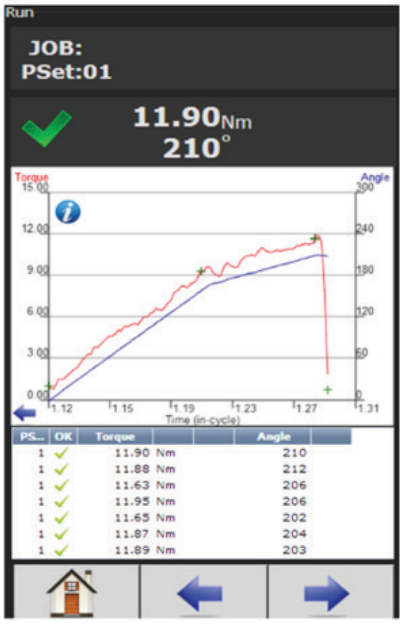


4. Home Page (Main Menu)



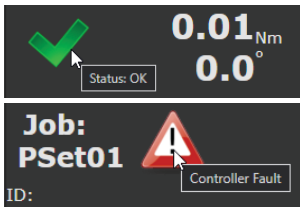
4.1 Run

The Run Screen is essentially the dashboard of the Gen IV controller and provides a look at real-time information regarding rundowns.



Time (In-Cycle) Screen

JOB:	Indicates the current JOB.
PSet:01	Indicates the current PSet in which you are operating.
	Indicates accepted rundown.
	Indicates failed rundown.
11.90Nm 210°	Displays Torque and Angle for current rundown.

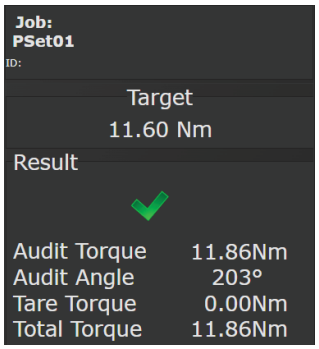


Click on (or remote sessions can hover over) the rundown status icon or stop icons for a text description.

Graph displays curves representing Torque (black trace) and Angle (blue trace). The blue left arrow at the origin of the graph will change the X-axis of the rundown curve from Time (In-Cycle) to Time (Overall) and Angle.

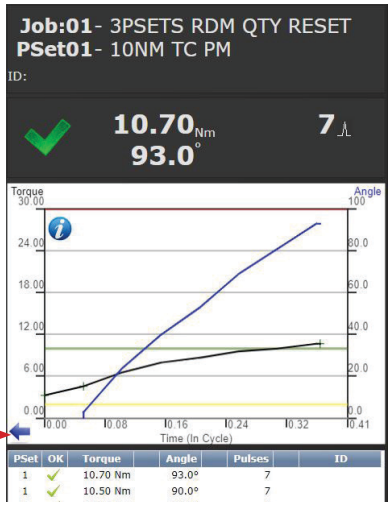
Below the graph is a historical table that will give information and status of the most recent rundowns, including current PSet, accepted/failed rundown status,torque and angle.

Arrows allow user to scroll through screens that show real time Job information such as Run Screen or rundown indicators.



Home tab will return user to the Home Page

On the Run Screen, click  for curve detail.



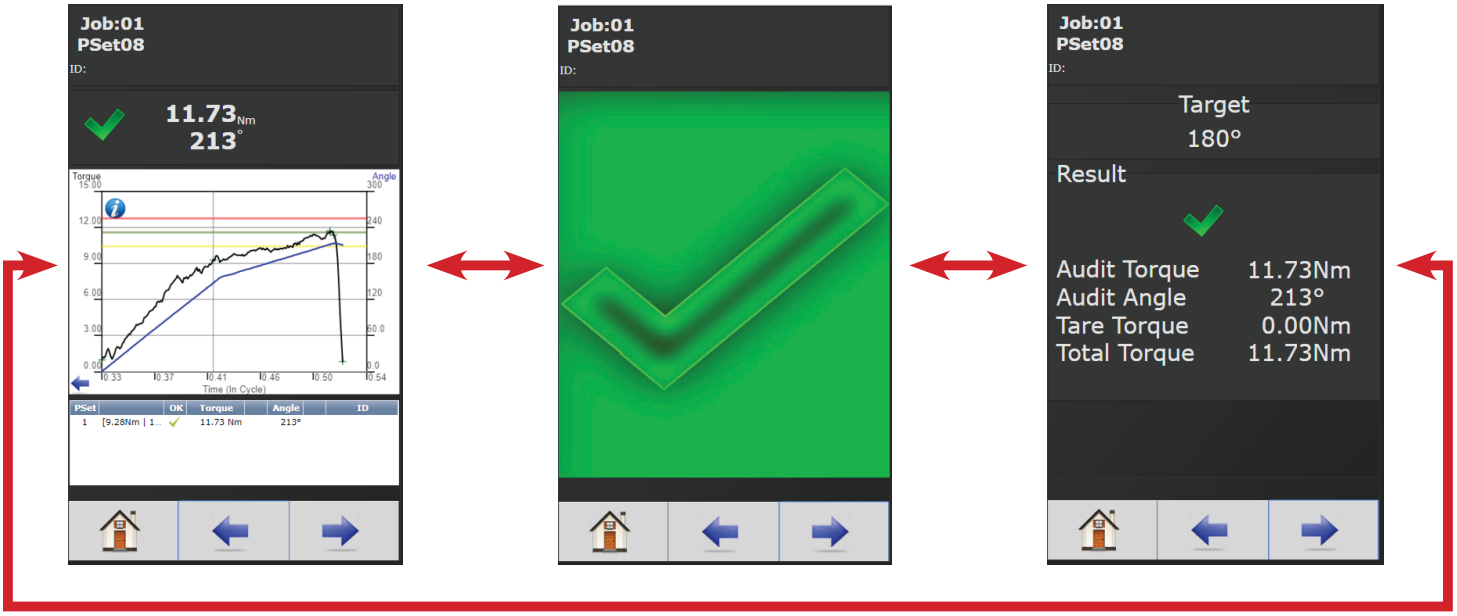
Click on blue arrow to change curve X axis.

Choose Time In-cycle, Time Overall, Angle, or Angle In-Cycle screen.

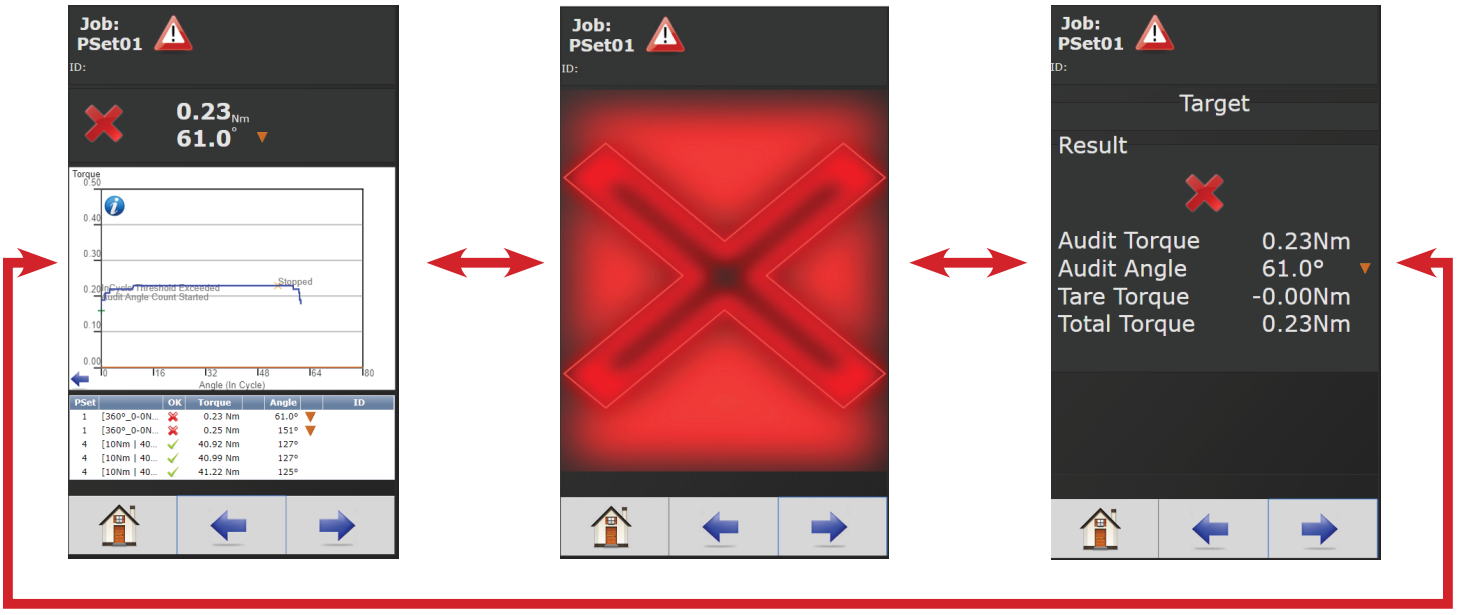
Large Screen Indicators and Audit information

The large screen indicators are helpful in viewing real time results of the rundown from a distance.

Example of Accepted Job



Example of Failed Job



4.2 PSet

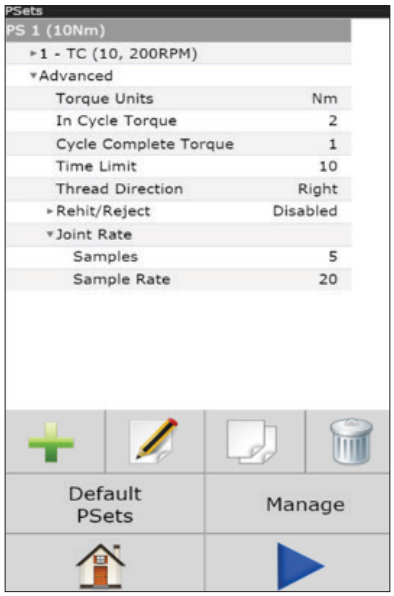
Parameter Settings (PSets) control the fastening process. The following describes the different fastening strategies and how to setup the basic PSet parameters necessary to perform a fastening. Up to 256 PSets are available.

For AcraDrive capable tools see "4.2.1.2 AcraDrive Discontinuous Drive Mode Settings" on page 11.

4.2.1 Add New PSet

On Home Page press the PSET tab.

On PSets screen press  to add a new Pset.



 Add a PSet

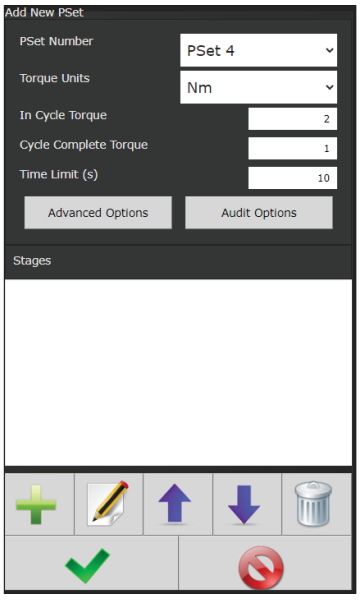
 Edit a PSet

 Coy a PSet

 Delete a PSet

Default PSets: See "3.2 Quick Set Up" on page 7.
Manage: See "4.2.6 Manage PSets" on page 28.

On Add New PSet screen (below) enter appropriate values.



PSet Number: Current PSet to be added.

Torque Units: Unit of measure.

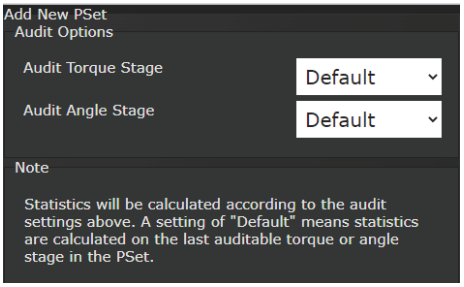
In Cycle Torque: Threshold value at which tool is "In Cycle" and results from the Rundown will be reported.

Cycle Complete Torque: Torque level that determines completion of a fastening cycle.

Time Limit(s): Maximum allowable time (in seconds) tool is allowed to run.

Advanced Options: see "4.2.4 Advanced Options" on page 27

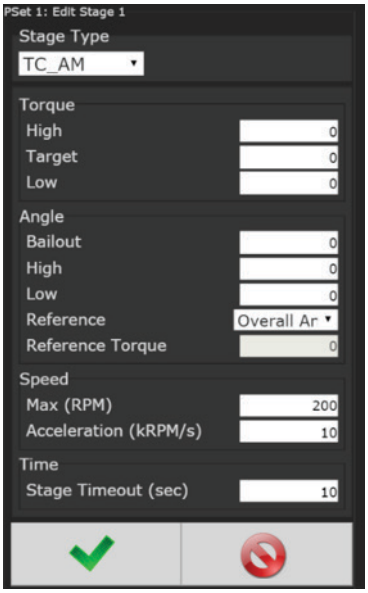
Audit Options: A PSet can be assigned 20 stages, and a tightening or loosening event can be performed in any of them. The Audit Options button allows the user to select the one stage that is of most importance and make the OK/NOK judgment of the event based on what transpires in that Stage. Default performs the Audit function after the last Stage completes.



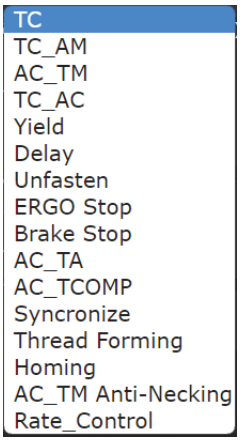
Once PSet values are entered press  to enter Add New Stage screen.

4.2.1.1 Add New Stage

A single stage or multiple stages build a PSet. Up to 20 stages can be assigned per PSet.



The following stage options are available:

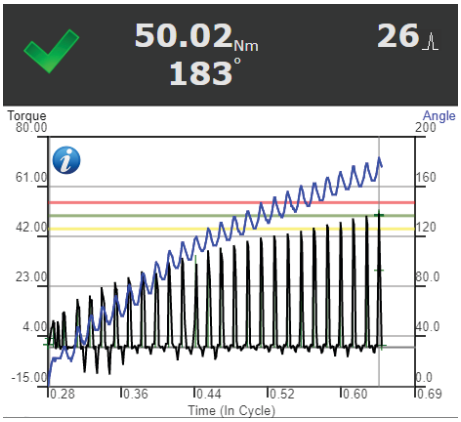


Once the desired stage(s) are selected and configured, press  to save stage and again to save the PSet and return to initial PSet menu.

Next Press  to go to the RUN screen or  to return to the Home page. The tool should now be operational and you are ready to run a configured PSet.

4.2.1.2 AcraDrive Discontinuous Drive Mode Settings

The iEC Discontinuous Mode pulses the tool output to reduce torque reaction forces on the operator. To accomplish this, the tool relies on motor and gear inertia to transmit torque to the fastener instead of only the torque capability of the motor. Discontinuous Mode is only available for tools designed for discontinuous mode operation.

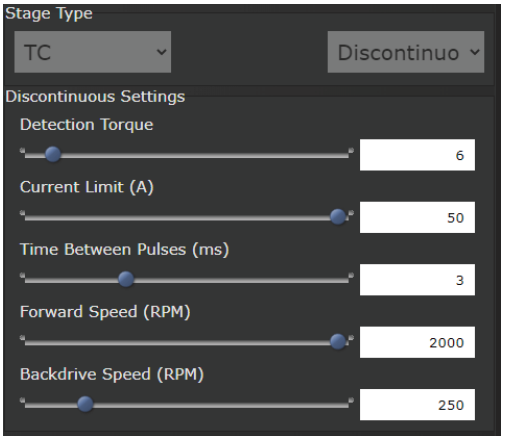


Discontinuous Mode Stages

The following stages can be used in Discontinuous Mode:

- TC (Torque Control)
- TC_AM (Torque Control, Angle Monitor)
- AC_TM (Angle Control, Torque Monitor)
- TC_AC (Torque Control, Angle Control)

Discontinuous Mode Parameters



Detection Torque: 1.0 – 10 Nm, 0.1 – 1.0 kgm, 0.75 – 7.5 ft-lb, 9.0 – 90 in-lb

- The Torque Value at which the forward-moving state transitions to the backward-moving state. Higher values for Detection Torque mean that in order to determine a pulse, the impact torque is greater than the Detection Torque.

Current Limit: 1 – 50 A

- Maximum current allowed throughout the duration of the rundown. Higher values allow more aggressive fastening, but lower values can improve accuracy.

Time Between Pulses: 0 – 10 ms

- How long to wait before the next pulse.

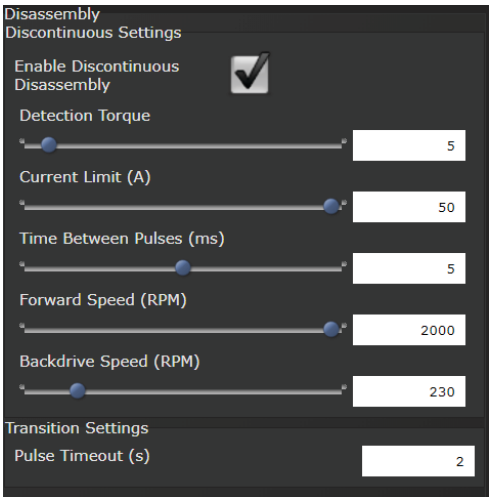
Forward Speed: 100 – 2000 RPM

- How fast to rotate in the fastening direction.

Backdrive Speed: 100 – 1000 RPM

- How fast to rotate in the un-fastening direction.

Discontinuous Mode Disassembly Parameters



Enable Discontinuous Disassembly:
- Determines whether to utilize Discontinuous Mode in disassembly. Only tools with Discontinuous Mode enabled can use this mode.

Detection Torque: 1.0 – 10 Nm, 0.1 – 1.0 kgm, 0.75 – 7.5 ft-lb, 9.0 – 90 in-lb
- The Torque Value at which the forward-moving state transitions to the backward-moving state. Higher values for Detection Torque mean that in order to determine a pulse, the impact torque is greater than the Detection Torque.

Current Limit: 10 – 50 A
- Maximum current allowed. Higher values allow more aggressive fastening, but lower values can improve accuracy.

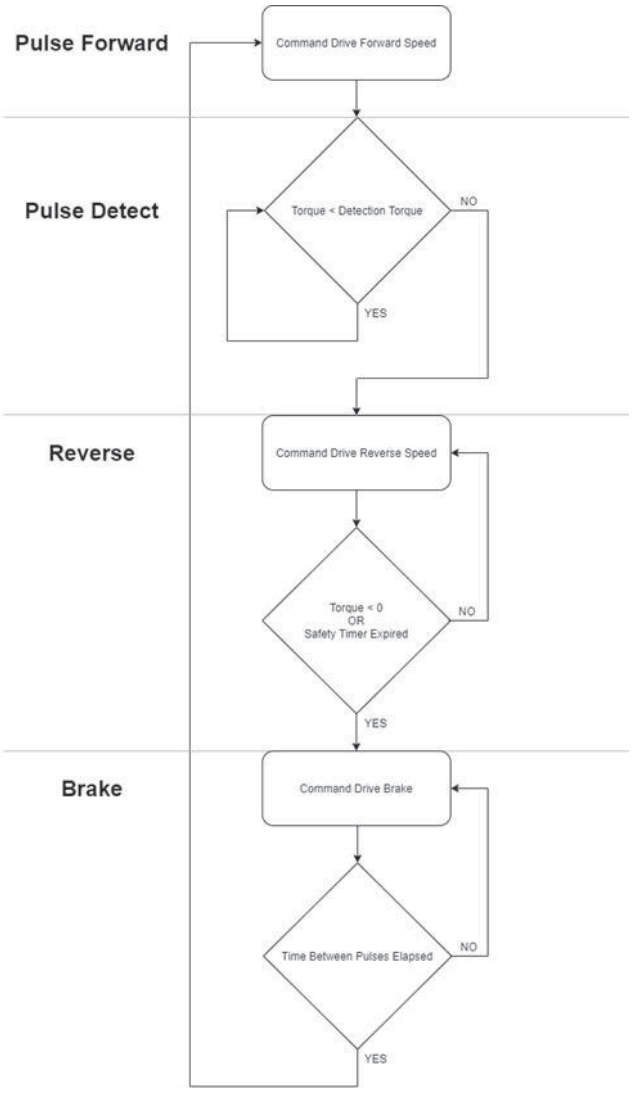
Time Between Pulses: 0 – 10 ms
- How long to wait before the next pulse.

Forward Speed: 100 – 2000 RPM
- How fast to rotate in the fastening direction.

Backdrive Speed: 100 – 1000 RPM
- How fast to rotate in the un-fastening direction.

Pulse Timeout: 0.1 – 10 seconds
- Amount of time not detecting a pulse required to transition into normal continuous disassembly.
  - When running in disassembly, the Pulse Time Out timer will start counting down and reset each time a pulse is detected
  - If a pulse is not detected before the timer times out, the tool will slow down to the continuous speed setting. This can help prevent the fastener from completely backing off the threads when disassembling.
  - If another pulse is detected while running the slower speed. The Pulse Time Out timer will reset, allowing the speed to return to the pulse Forward Speed setting.

Discontinuous Mode Sequence of Operation:



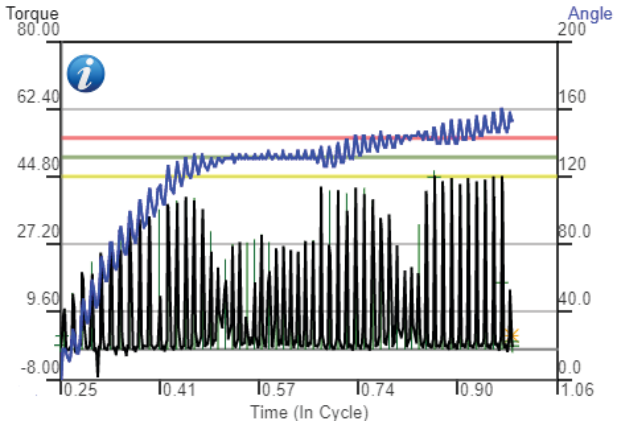
The following steps occur in sequence until either the target torque has been reached, a fault occurs, or a limit is reached:

1. The motor is commanded forward at Forward Speed until the measured torque exceeds Detection Torque.
2. The motor is commanded backward at Backdrive Speed until either the measured torque becomes negative, or an internal safety timer has expired.
3. The motor is commanded to brake until Time Between Pulses has elapsed.

Optimization and Troubleshooting

The following are examples of potential issues and how they can potentially be solved with minor tweaks to the Pulse Settings mentioned previously in this section.

- **The tool stalls and struggles to reach the Target Torque:**



  - Increase Current Limit if it isn't already at the maximum allowed value.
  - Increase Backdrive Speed to prevent the tool from vibrating in place (the flat spot on the angle graph above shows an example of this).

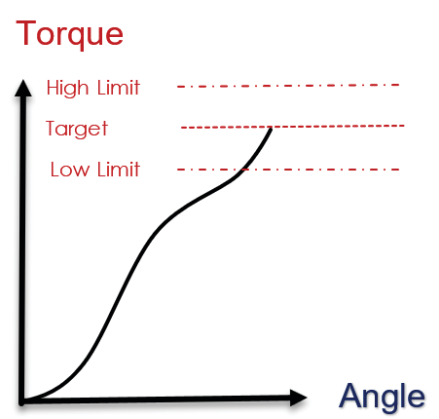
- **The tool exceeds the High Torque limit:**
  - Decrease Current Limit to create softer pulses.
  - Decrease Forward Speed to reduce torque overshoot.
  - If neither of the above fix the problem, try the following:
    - Change the PSet to have two Discontinuous Mode stages instead of one:
      - The first should be more aggressive, with maximum Current Limit and/or Forward Speed.
      - The second should be less aggressive, with decreased Current Limit and/or Forward Speed.
    - Ensure the PSet has a Brake Stop stage at the end.
  - Increasing Detection Torque can also sometimes increase torque accuracy.

- **The tool is not driving the fastener forward:**
  - Decrease Backdrive Speed to ensure the tool doesn't back off too much after a pulse.

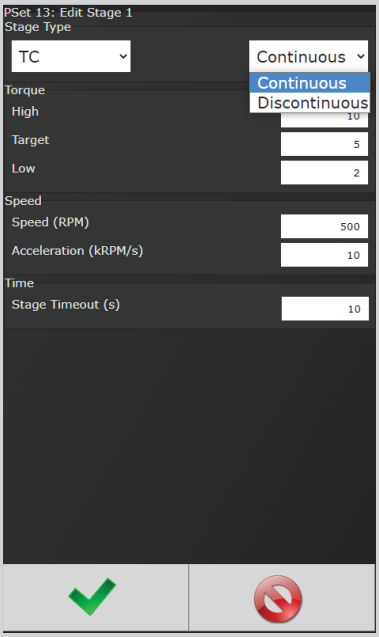
- **The reaction force on the operator is too much:**
  - Decrease Detection Torque.
  - Decrease Current Limit.
  - Decrease Forward Speed.

4.2.2 PSet Stages

4.2.2.1 TC Torque Control Stage



Control strategy uses torque as the only control parameter. The tool stops when *Torque Target* is reached. Rundown is considered to be successful (Accept) if the stage peak torque value falls within the range specified by the *Torque High Limit* and the *Torque Low Limit* parameters.



Stage Type:
- Continuous Drive
- Discontinuous Drive

Torque High: The upper control limit of the rundown.

Torque Target: Final desired torque.

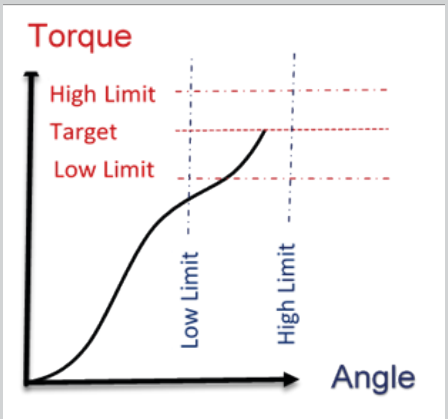
Torque Low: The lower control limit of the rundown.

Speed (RPM): Tool Output speed target.

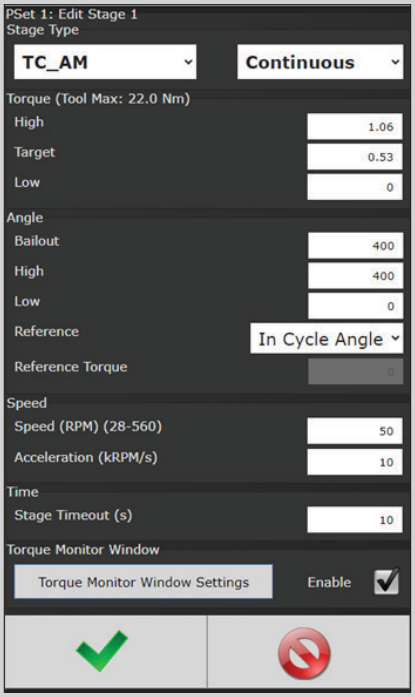
Acceleration (kRPM/s): The length of time it will take for tool to change speed. The lower the value the slower the acceleration (see "6. Glossary" on page 61 for detailed description).

Stage Timeout (s): Maximum allowable time (in seconds) in this stage. If time is exceeded, the tool will stop and Rundown will be terminated.

4.2.2.2 *TC_AM Torque Control Angle Monitor Stage*



Control strategy is convenient for detection of cross threaded or stripped fasteners. Rundown is considered to be successful (Accept) if the stage peak torque value falls within range specified by *Torque High Limit* and *Torque Low Limit* and final angle value falls within the range specified by *Angle High Limit* and *Angle Low Limit* parameters.



Stage Type:
- Continuous Drive
- Discontinuous Drive

Torque High: Upper control limit of the rundown.

Torque Target: Final desired torque.

Torque Low: The lower control limit of the rundown.

Angle Bailout: Determines when to stop the tool on angle during any Torque Control strategy. Should be set equal to or above High Angle. Units are degrees of rotation.

Angle High: Maximum acceptable angle rotation in degrees.

Angle Low: Minimum acceptable angle rotation in degrees.

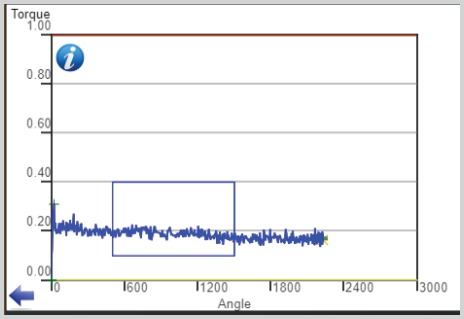
Angle Reference: (drop down menu)
- **Overall Angle:** Angle is measured starting from lever/trigger pull.
- **In-cycle Angle:** Angle is measured from In-Cycle torque value (determined in PSet screen).
- **Stage Angle:** Angle is measured from Reference Torque.
  If Stage Angle is selected, this will be the start point (in Torque) at which angle is monitored.
  NOTE: Set Reference Torque to zero to measure Stage Angle from the beginning of the stage.

Reference Torque: If Stage Angle is selected in the Reference menu, this will be the Torque start point at which angle is monitored.

Speed (RPM): Tool Output speed target.

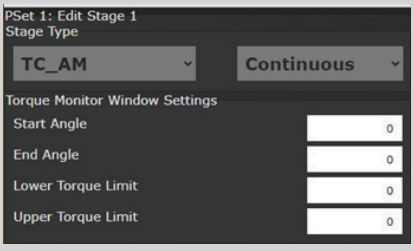
Acceleration(kRPM/s): How quickly the tool will change speed. The lower the value the slower the acceleration (see "6. Glossary" on page 61 for detailed description).

Stage Timeout (s): Maximum allowable time (in seconds) in this stage. If time is exceeded, the tool will stop and the Rundown will be terminated.



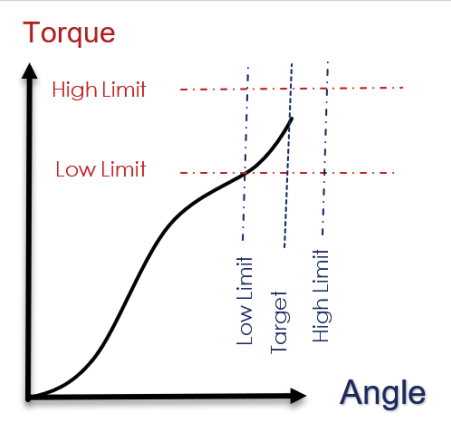
Runscreen with Torque Monitor Window

Torque Monitor Window: Enabling the Torque Monitor Window adds a window on the runscreen that shows start/end angle thresholds as well as lower and upper torque limits. When the Angle Reference is between the Start/End Angle Limits, the Torque must remain between the Lower and Upper Torque limits. If the Torque goes outside these limits, the rundown will be aborted and flagged as a reject.



- **Start Angle:** Lower angle reference threshold to audit torque.
- **End Angle**: Upper angle reference threshold to audit torque.
- **Lower Torque Limit:** Minimum torque value within angle window.
- **Lower Torque Limit**: Maximum torque value within angle window.

4.2.2.3 *AC_TM Angle Control Torque Monitor Stage*



Control strategy in which the tool stops when *Angle Target* is reached or *Torque High Limit* is exceeded. Rundown is considered to be successful (Accept) if the stage peak torque value falls within range specified by torque upper and lower limits and final angle value falls within the range specified by *Angle High Limit* and *Angle Low Limit* parameters.

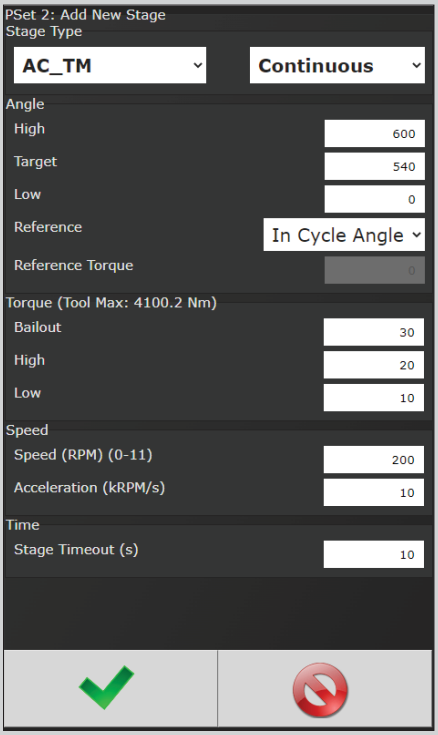
Stage Type:
- Continuous Drive
- Discontinuous Drive

Angle High: Maximum allowed angle rotation in degrees.

Angle Target: Angle target desired.

Angle Low: Minimum allowed angle rotation in degrees.

Angle Reference: (drop down menu)
- **Overall Angle:** Angle is measured starting from lever/trigger pull.
- **In-cycle Angle:** Angle is measured from In-Cycle torque value (Determined in PSet screen).
- **Stage Angle:** Angle is measured from Reference Torque.



Reference Torque: If Stage Angle is selected in the reference menu, this will be the start point (in Torque) at which angle is monitored.

NOTE: Set Reference Torque to zero if you want Stage Angle measured from the beginning of the stage.

Torque Bailout: Determines when to stop the tool based on torque value during any Angle Torque Bailout value should be equal or greater than High Torque.

Torque High: Upper control limit of the rundown.

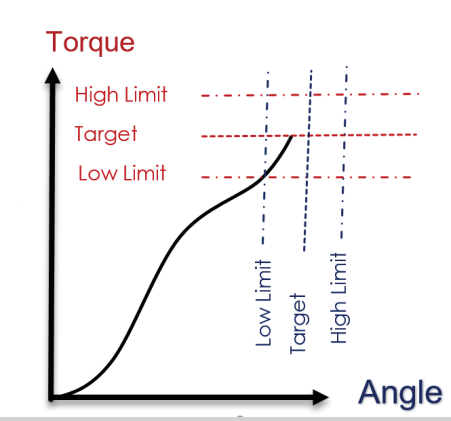
Torque Low: Lower control limit of the rundown.

Speed (RPM): Tool Output speed target.

Acceleration (kRPM/s): How quickly the tool will change speed. The lower the value, the slower the acceleration (see "6. Glossary" on page 61 for detailed description).

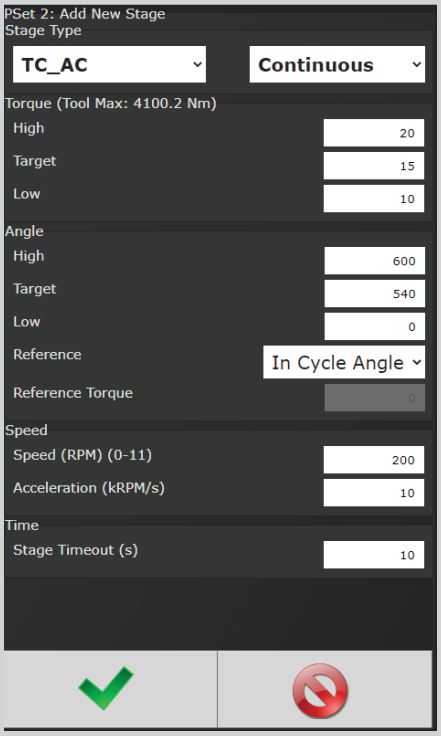
Stage Timeout (s): Maximum allowable time (in seconds) in this stage. If time is exceeded, the tool will stop and the Rundown will be terminated.

4.2.2.4 TC_AC Torque Control Angle Control Stage



Control strategy in which the tool stops if *Target Torque* or *Target Angle* is reached, whichever happens first.

Rundown is considered to be successful (Accept) if the stage peak torque value falls within range specified by *Torque High Limit* and *Torque Low Limit*, and final angle value falls within the range specified by *Angle High Limit* and *Angle Low Limit* parameters.



Stage Type:
- Continuous Drive
- Discontinuous Drive

Torque High: Upper control limit of the rundown.

Torque Target: Final desired torque.

Torque Low: Lower control limit of the rundown.

Angle High: Maximum allowed angle rotation in degrees.

Angle Target: Angle target desired.

Angle Low: Minimum allowed angle rotation in degrees.

Angle Reference: (drop down menu)
- **Overall Angle:** Angle is measured starting from lever/ trigger pull.
- **In-cycle Angle:** Angle is measured from In-cycle value (determined in PSet screen.)
- **Stage Angle:** Angle is measured from Reference Torque.

Reference Torque: If Stage Angle is selected in the Reference Menu, this will be the start point (in Torque) at which angle is monitored.

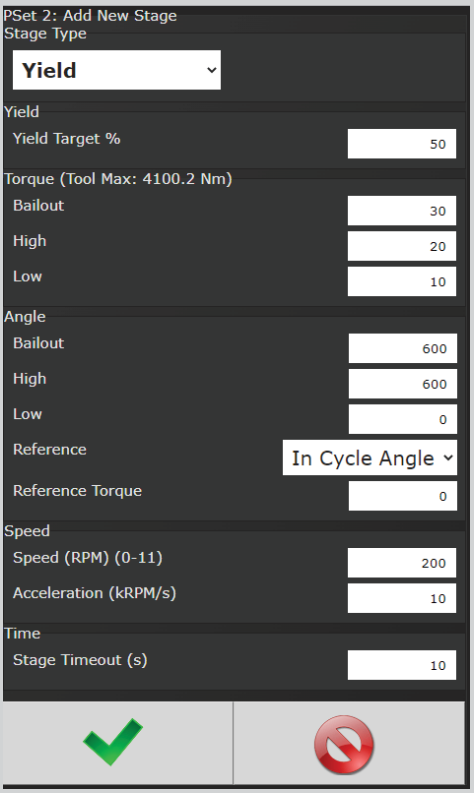
NOTE: Set Reference Torque to zero if you want Stage Angle measured from the beginning of the stage.

Speed (RPM): Tool Output speed target.

Acceleration (kRPM/s): How quickly the tool will change speed. The lower the value, the slower the acceleration (see "6. Glossary" on page 61 for detailed description).

Stage Timeout (s): Maximum allowable time (in seconds) in this stage. If time is exceeded, the tool will stop and the Rundown will be terminated.

4.2.2.5 *Yield Control Stage*



This strategy detects the yield of the fastener and reports the torque and angle that resulted from the fastening event.

Controlling by detecting Yield is very beneficial on joints where clamp load varies greatly relative to final torque.

This strategy can be used alone or combined with other strategies as steps in a parameter set. As an example, a common fastening strategy could be three steps:

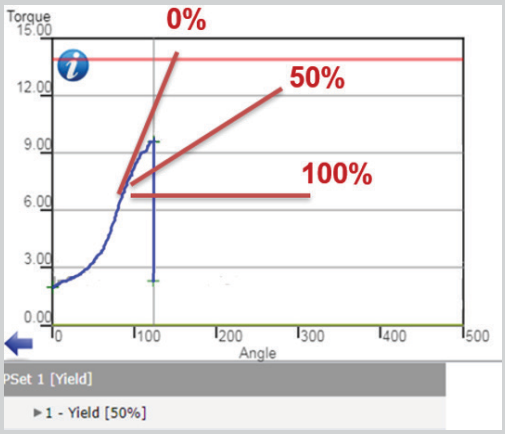
- Torque Stage – To set a minimum threshold
- Yield Stage – To control clamp load
- Angle Stage – To attain a specific bolt stretch above Yield

Yield Target %: Programmable with a default setting of 50%.

The lower this value, the more sensitive the strategy will be. Too low could cause early and false detection.

The higher this value, the less sensitive the strategy will be. A more pronounced change in slope is required for the yield to be determined.

The measurement is joint specific and 0% when parallel to the slope determined to be the elastic range and 100% is when the slope is horizontal.



Joint Rate parameters have default settings of 5 samples every 20 degrees. This resolution can be adjusted if needed.

See "AC_TM Angle Control Torque Monitor Stage" on page 16 for Torque, Angle, Speed, and Time parameter details).

Torque Bailout: Determines when to stop the tool based on torque value during any Angle Torque Bailout value should be equal or greater than High Torque.

Torque High: Upper control limit of the rundown.

Torque Low: Lower control limit of the rundown.

Angle Bailout: Determines when to stop the tool on angle during any Torque Control strategy. Should be set equal to or above High Angle. Units are degrees of rotation.

Angle High: Maximum acceptable angle rotation in degrees.

Angle Low: Minimum acceptable angle rotation in degrees.

Angle Reference: (drop down menu)

- **Overall Angle:** Angle is measured starting from lever/trigger pull.
- **In-cycle Angle:** Angle is measured from In-Cycle torque value (determined in PSet screen).
- **Stage Angle:** Angle is measured from Reference Torque.
  If Stage Angle is selected, this will be the start point (in Torque) at which angle is monitored.
  NOTE: Set Reference Torque to zero to measure Stage Angle from the beginning of the stage.

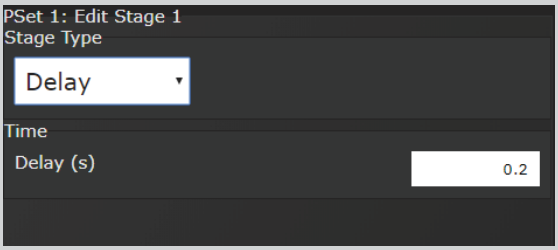
Reference Torque: If Stage Angle is selected in the Reference menu, this will be the Torque start point at which angle is monitored.

Speed (RPM): Tool Output speed target.

Acceleration(kRPM/s): How quickly the tool will change speed. The lower the value the slower the acceleration (see "6. Glossary" on page 61 for detailed description).

Stage Timeout (s): Maximum allowable time (in seconds) in this stage. If time is exceeded, the tool will stop and the Rundown will be terminated.

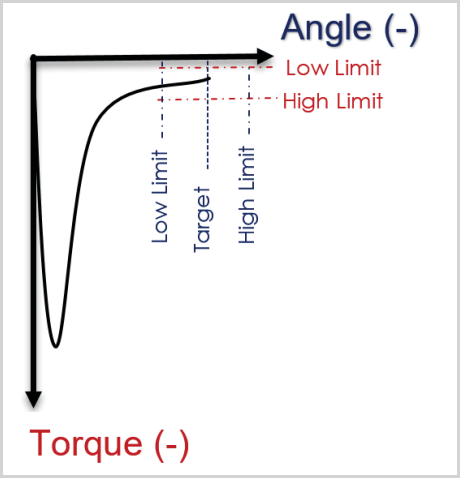
4.2.2.6 *Delay Stage*



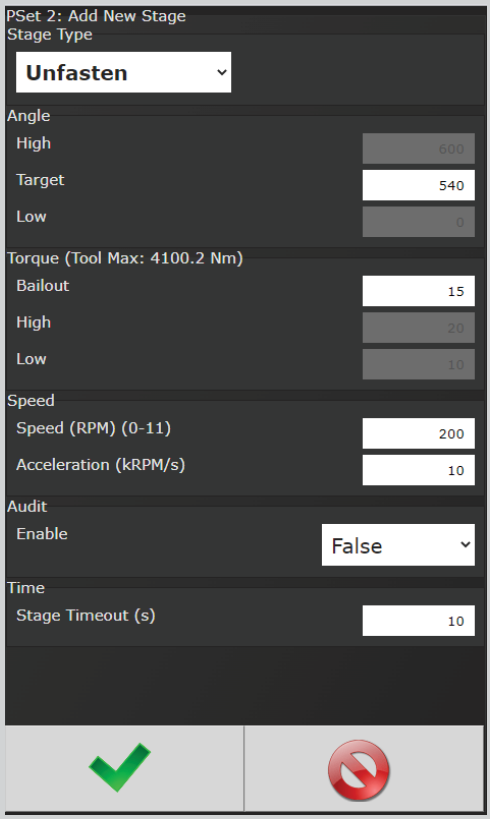
This stage determines the time delay between stages.

Time Delay (s): Total time (in seconds) the tool stops and waits before proceeding to the next stage. Default is 0.2 (sec).

4.2.2.7 *Unfasten Stage*



This feature is a specific "backoff" stage used, for example, in a Rundown-Backoff or Rundown-Backoff-Rundown configuration. NOTE: In this stage, the tool always runs opposite of the thread direction.



Angle High: Maximum allowed angle rotation in degrees.

Angle Target: Degrees of rotation the tool will backoff in reverse.

Angle Low: Minimum allowed angle rotation in degrees.

Torque Bailout: Determines when to stop the tool based on torque value during any Angle Control strategy; should be equal or greater than High Torque.

Torque High: Upper control limit of the rundown.

Torque Low: Lower control limit of the rundown.

Speed (RPM): Tool Output speed target (in the unfastening direction).

Acceleration (kRPM/s): How quickly tool will change speed. The lower the value, the slower the acceleration (see "6. Glossary" on page 61 for detailed description).

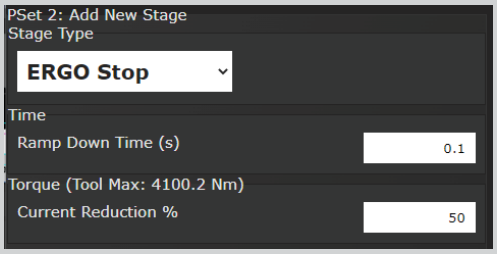
Audit Enable:

False: When set to False the stage will not be evaluated for pass or fail.

True: When set to True the stage will be evaluated for pass or fail using high and low limits.

Stage Timeout (s): Maximum allowable time (in seconds) in this stage. If time is exceeded, the tool will stop and the Rundown will be terminated.

4.2.2.8 *Ergo Stop Stage*

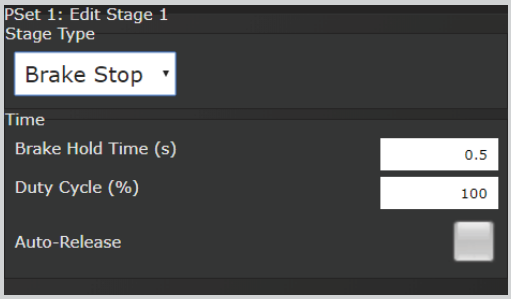


Ramps cut-off power when fastening achieves *Target Torque* or *Target Angle* value. This feature reduces torque reaction to the operator in a hand-held tool as final torque or angle is achieved.

Ramp Down Time (s): Total time (in seconds) to ramp down to zero current/torque.

Torque Current Reduction %: Amount (in percent) to reduce the current to the motor.

4.2.2.9 *Brake Stop Stage*



The Brake Stop Stage is used for electronic braking of the tool. It can be helpful in applications where a high RPM is used for the rundown, helping to reduce torque and angle target overshoot.

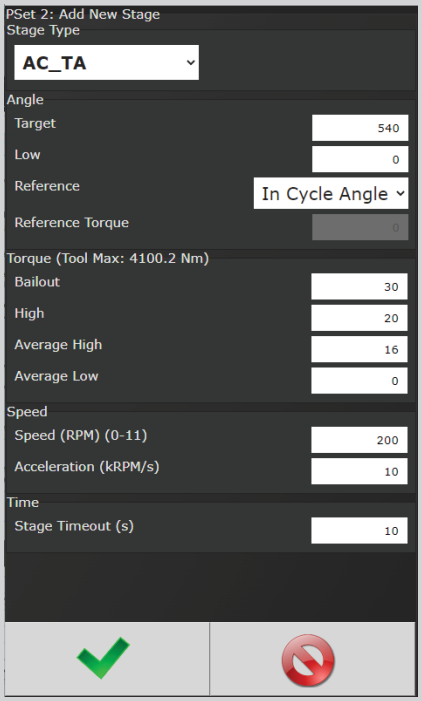
The Brake Stop stage is also required after a high torque target stage, to prevent the tool motor from springing backwards too fast as the tool gearing relaxes. This motor back drive can cause a voltage spike on the drive DC bus. This spike in voltage can result in drive or other faults to occur. As a guideline, rundowns exceeding 1,000Nm should have a brake stop as the final stage.

Brake Hold Time (s): Amount of time (in seconds) that brake is applied.

Duty Cycle %: Manual control the strength of the brake force – a higher value is stronger

Auto-Release: Automatically controls the strength of the brake force and releases when cycle complete torque is reached. It is recommended to enable this when using the brake stop to relax the joint after a high torque rundown, to prevent voltage spikes.

4.2.2.10 AC_TA Angle Control Torque Averaging Stage



Control Strategy that is helpful in applications where the rotational resistance measured can produce a pass or fail reading. This will help in gauging rolling resistance of a given part and aid in detecting latent failures in rotating assemblies.

Angle Target: Angle target desired.

Angle Low: Minimum allowed angle rotation in degrees.

Angle Reference: (drop down menu)

- **Overall Angle:** Angle is measured starting from lever/trigger pull.
- **In-cycle Angle:** Angle is measured from In-Cycle torque value determined in PSet screen).
- **Stage Angle:** Angle is measured from Reference Torque.

Reference Torque: If Stage Angle is selected in the Reference menu, this will be the Torque start point at which angle is monitored.

Torque Bailout: Determines when to stop the tool based on torque value during any Angle. Torque Bailout value should be equal or greater than High Torque.

Torque High: Upper control limit of the rundown.

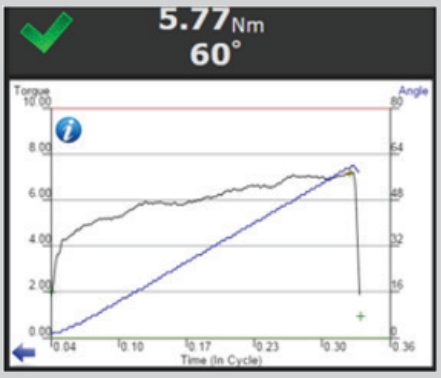
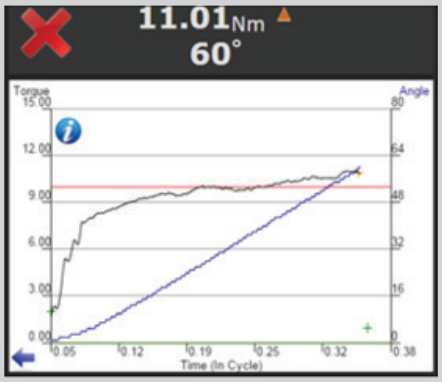
Average High: The average high torque of the rundown.

Average Low: The average low torque of the rundown.

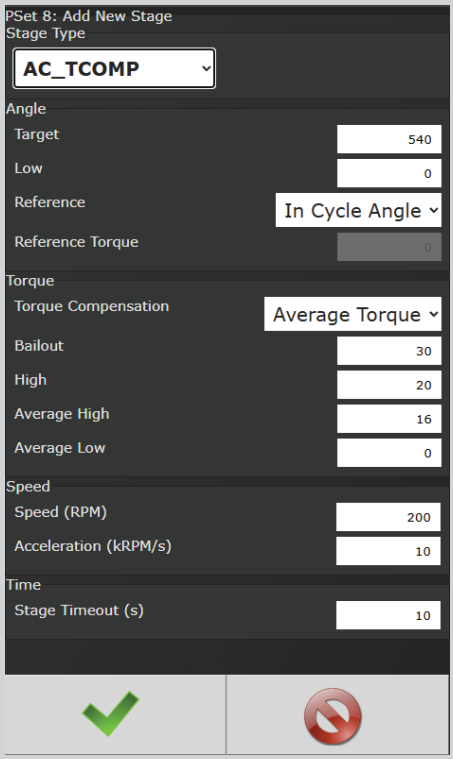
Speed (RPM): Tool Output speed target.

Acceleration (kRPM/s): How quickly the tool will change speed. The lower the value the slower the acceleration (see "6. Glossary" on page 61 for detailed description).

Stage Timeout (s): Maximum allowable time (in seconds) in this stage. If time is exceeded, the tool will stop and the Rundown will be terminated.

Pass	Fail
	
Average Torque falls within Avg. Torque limits. Reported torque is the average of the torque measured during the AC_TA Stage. Notice that final torque is greater than the Avg. Torque High limit.	Average Torque greater than Avg. Torque High limit. Reported torque is the average of the torque measured during the AcTa Stage.

4.2.2.11 AC_TCOMP Angle Control Torque Compensation Stage



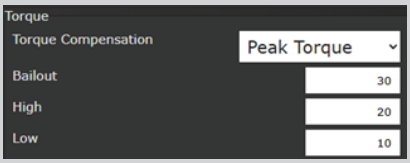
In the fastening shown, the first stage is an *Angle Control Torque Compensation* strategy followed by a torque control strategy to 4Nm. This will allow a consistent 4Nm to be applied to the clamp load of the part.

The Angle Control Torque Compensation Strategy is used to compensate for the prevailing torque of the fastener. The prevailing torque can be averaged or determined by the peak over a set angle and the torque will be adjusted by the average or peak torque measured. Then the prevailing torque can be removed from the final torque applied to the fastener.

Torque Setup:

Average Torque Compensation: This is similar to "AC_TA Angle Control Torque Averaging Stage" on page 21, but re-tares the transducer with average torque.

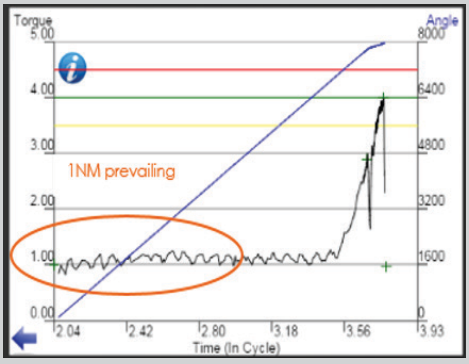
Peak Torque Compensation: This is similar to "AC_TM Angle Control Torque Monitor Stage" on page 16, but re-tares the transducer with peak torque.

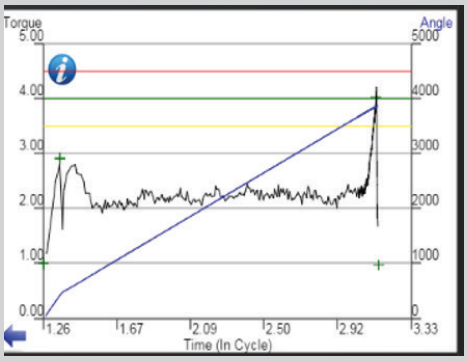


Removing the Prevailing Torque:
These Torque Compensation strategies measure the average or peak prevailing torque over a given angle. At the completion of the stage, the tare value of the torque transducer will be adjusted by the average or peak torque, removing the prevailing torque readings for the remainder of the fastening cycle.

The Problem

In the two following fastening cycles, the final torque is 4Nm. The first fastening has about 1Nm of prevailing torque during the free run and the second has about 2Nm. In the first fastening, about 3Nm of torque goes into the final clamping load of the joint. The second fastening only gets about 2Nm of torque to clamp the part, 33% less than the first.





4.2.2.12 AC_TCOMP Display of Torque Compensation Value

LED Display: The bottom LED display field can be configured to display the Torque Compensation Tare Value by using the toggle button to select 'COMP' from the available options.

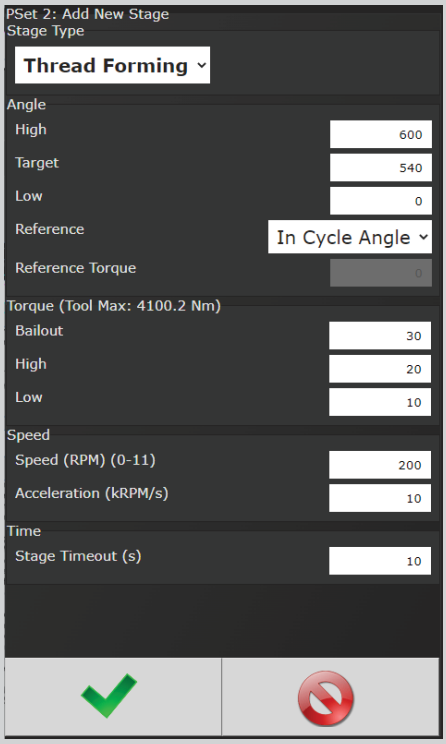
Run Screen: In addition to the Final Audit Torque, the Final Torque Total and the Torque Compensation Value will be displayed if an AC_TComp stage was completed during the rundown.

4.2.2.13 Sync Stage

Set synchronization point between stages for spindle networks. All spindles will wait on this stage until all controllers are ready to proceed to the next stage.

Stage Timeout (s): Total time in seconds the controller will wait in this stage before timing out and aborting the rundown.

4.2.2.14 Thread Forming Stage



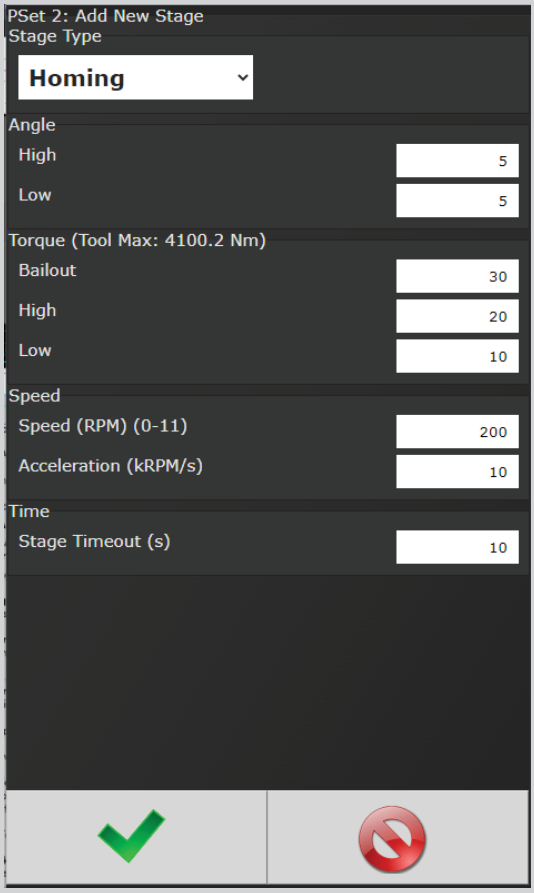
The 'Thread Forming PSet Strategy' can be used in fastening applications where the initial thread forming torque is greater than the final torque target to be left on the fastener. This strategy is intended to be used as the first stage of a multistage PSet, prior to the final audit stage.

The Thread Forming Strategy is a variant of the Angle Control Torque Monitoring (AC_TM) Stage, which in addition, includes a reset of the overall peak torque value when the stage completes. This provides a way to reset the peak torque value after thread forming so that only the peak torque from the fastening portion of the rundown is used for the overall evaluation of the rundown and reported.

Sequence of Operation: The stage will run until the angle target is reached, or is terminated early. If the stage completes successfully the overall peak torque is reset to the current torque value, then the next stage in the sequence will begin. If the stage is terminated early, or fails on the torque and angle limits, the overall peak torque is not reset and the rundown will be terminated.

Setup: See "AC_TM Angle Control Torque Monitor Stage" on page 16 for Torque, Angle, Speed, and Time parameter details)

4.2.2.15 Homing Stage



Control strategy in which the tool's output returns to a home position in the direction set in the parent PSet. The home position is defined by the position of the output when the controller is powered on. The stage is considered successful (Accept) if the output travels and stops within the home region, defined by the angle high and low limits. If the output is already in the home region when the stage begins, the tool will perform a revolution first. When the output crosses the lower limit, the tool will brake to a stop. After completing the stage, the position of the output, referenced from the home position, will be reported.

Angle High: Upper limit of the Tool Output position defining the home region. (Units: Degrees from the Home position in the direction of rotation defined in the PSet)

Angle Low: Lower limit of the Tool Output position defining the home region. (Units: Degrees from the Home position in the opposite direction of rotation defined in the PSet).

Torque Bailout: The tool will stop if this torque is exceeded. The Torque Bailout value should be equal or greater than High Torque.

Torque High: Upper control limit of the rundown.

Torque Low: Lower control limit of the rundown.

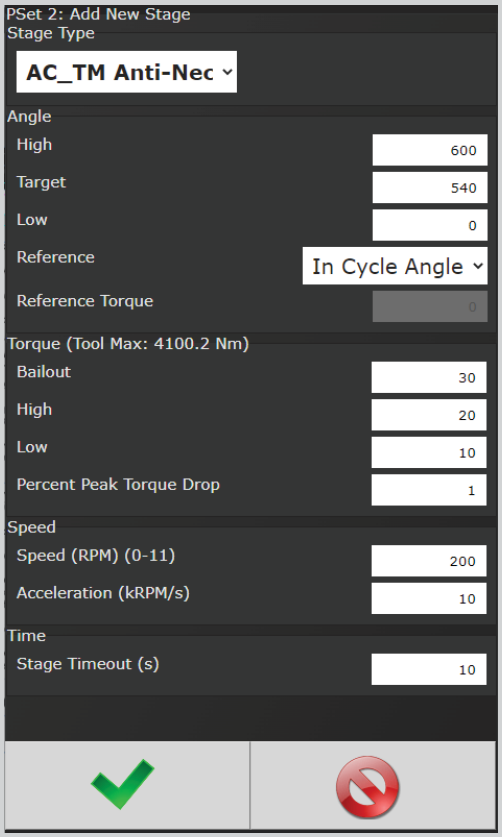
Speed (RPM): Tool Output speed target.

Acceleration (kRPM/s): How quickly the tool will change speed. The lower the value the slower the acceleration (see "6. Glossary" on page 61 for detailed description).

Stage Timeout (s): Maximum allowable time (in seconds) in this stage. If time is exceeded, the tool will stop and the Rundown will be terminated.

Note: To maintain the tool's home position without drifting, some tools will require a more refined value for the tool parameter PPRO. Please contact an AIMCO representative for instructions on how to load this value into the tool if it is needed.

4.2.2.16 AC_TM Anti-Necking Stage



Control strategy in which the tool stops when *Angle Target* is reached, or *Torque High Limit* is exceeded. Rundown is considered to be successful (Accept) if the stage peak torque value falls within the range specified by torque upper and lower limits and final angle value falls within the range specified by *Angle High Limit* and *Angle Low Limit* parameters. If the final torque of the rundown is not within the parameter specified by *Percent Peak Torque Drop*, the rundown is considered be unsuccessful and a low torque will be reported.

Angle High: Maximum allowed angle rotation in degrees.

Angle Target: Angle target desired.

Angle Low: Minimum allowed angle rotation in degrees.

Angle Reference: (drop down menu)

- **Overall Angle:** Angle is measured starting from lever/trigger pull.
- **In-cycle Angle:** Angle is measured from In-Cycle torque value (determined in PSet screen).
- **Stage Angle:** Angle is measured from Reference Torque.

Reference Torque: If Stage Angle is selected in the Reference menu, this will be the start point (in Torque) at which angle is monitored.

NOTE: Set Reference Torque to zero if you want Stage Angle measured from the beginning of the stage.

Torque Bailout: Determines when to stop the tool based on torque value during any Angle Torque Bailout value should be equal or greater than High Torque.

Torque High: Upper control limit of the rundown.

Torque Low: Lower control limit of the rundown.

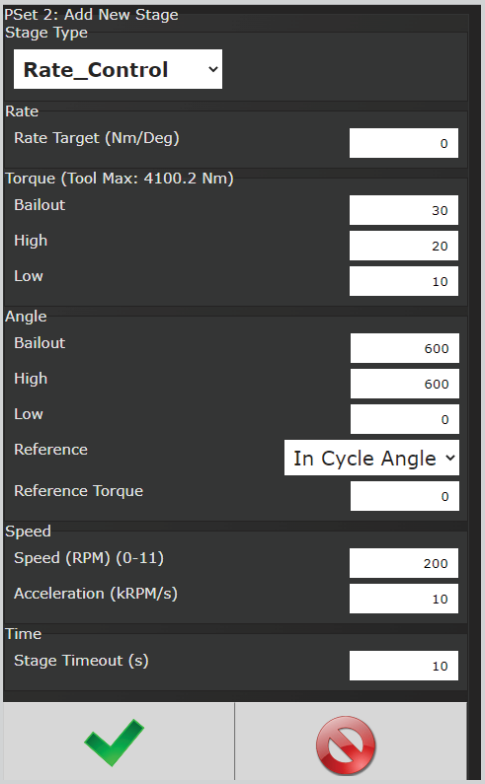
Percent Peak Torque Drop: The maximum allowed percentage torque drop from peak torque during a rundown. If the final torque is too low, a low torque will be reported.

Speed (RPM): Tool Output speed target.

Acceleration (kRPM/s): How quickly the tool will change speed. The lower the value the slower the acceleration (see "6. Glossary" on page 61 for detailed description).

Stage Timeout (s): Maximum allowable time (in seconds) in this stage. If time is exceeded, the tool will stop and the Rundown will be terminated.

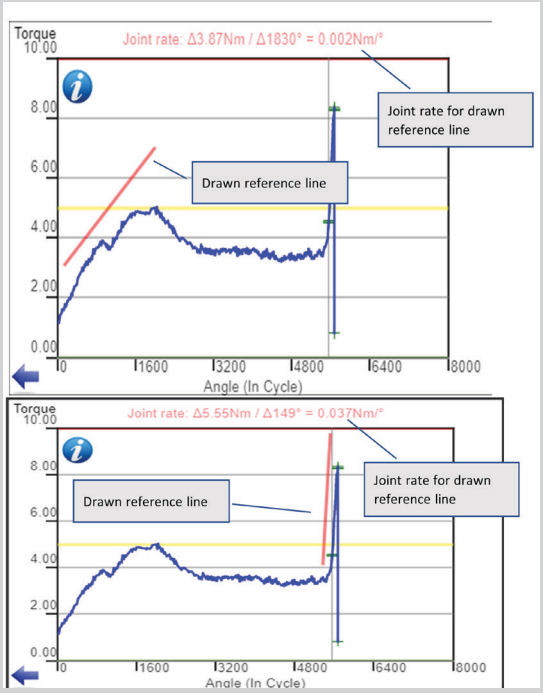
4.2.2.17 *Rate_Control Stage*



The joint rate is monitored and the stage is complete when it exceeds Rate Target (Nm/deg or another torque unit if selected in the PSet). This strategy can be used to detect when the parts are initially clamped (large change in the joint rate). A typical usage would add an AC_TM stage after it to get a more consistent clamp load on the part.

Rate Target: The target joint rate for the tool to shutoff or switch to the next stage. The units depend on the torque units selected for the parameter set (default Nm/deg).

The controller Torque/ Angle graph can be used to help determine the value for the Rate Target. While connected to the controller with an external browser (not the controller touch screen), Reference lines can be drawn on the graph (run screen and saved results) and the joint rate for the line will be calculated. Clicking on the graph will remove any reference line.



Torque Bailout: Determines when to stop the tool based on torque value during any Angle Torque Bailout value should be equal or greater than High Torque.

Torque High: Upper control limit of the rundown.

Torque Low: Lower control limit of the rundown.

Angle Bailout: Determines when to stop the tool on angle during any Torque Control strategy. Should be set equal to or above High Angle. Units are degrees of roataion.

Angle High: Angle target desired.

Angle Low: Minimum allowed angle rotation in degrees.

Angle Reference: (drop down menu)

- **Overall Angle:** Angle is measured starting from lever/trigger pull.
- **In-cycle Angle:** Angle is measured from In-Cycle torque value (determined in PSet screen).
- **Stage Angle:** Angle is measured from Reference Torque.

Reference Torque: If Stage Angle is selected in the Reference menu, this will be the start point (in Torque) at which angle is monitored.

NOTE: Set Reference Torque to zero if you want Stage Angle measured from the beginning of the stage.

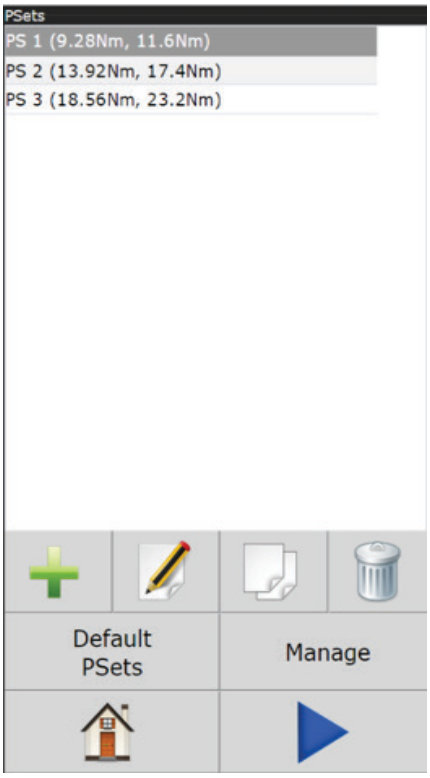
Speed (RPM): Tool Output speed target.

Acceleration (kRPM/s): How quickly the tool will change speed. The lower the value the slower the acceleration see "6. Glossary" on page 61 for detailed description).

Stage Timeout (s): Maximum allowable time (in seconds) in this stage. If time is exceeded, the tool will stop and the Rundown will be terminated.

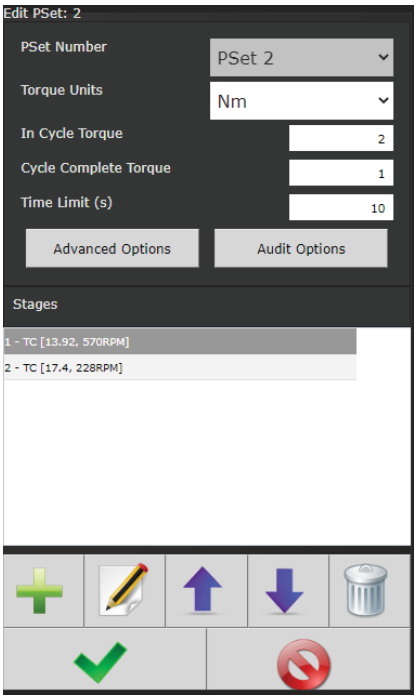
4.2.3 Edit PSet

On Home page press PSET

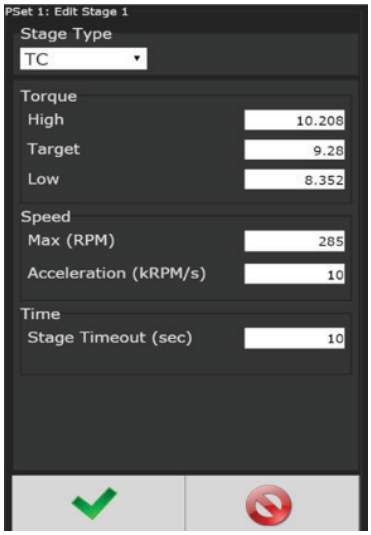


On the PSet screen click on the desired PSet you would like to edit.

Click on the Edit button to make changes in the Edit screen (below).

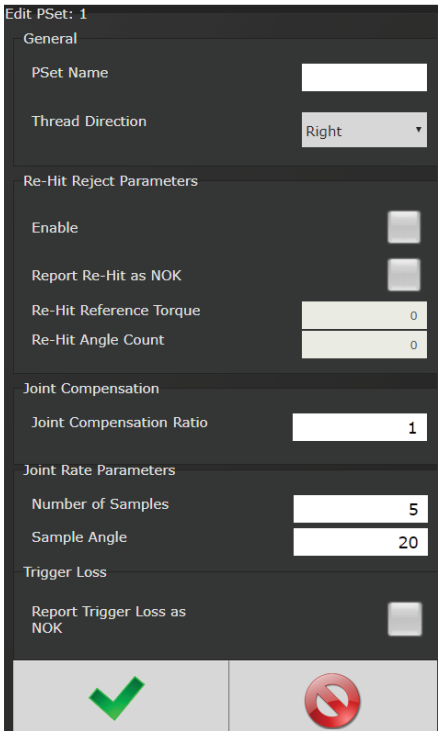


If further Stage changes are needed click the Edit button again to enter Edit Stage screen (below).



Once desired changes are made click twice to save changes.

4.2.4 Advanced Options



PSet Name: Add PSet name if desired (up to 10 characters).

Thread Direction: Defines fastening direction (default is right hand).

Re-hit/Reject Parameters: Prevents the fastening of an already tightened fastener. If enabled, tool will stop and the rundown will be aborted, if the angle of rotation between the Re-Hit Reference Torque and the In-Cycle Torque is less than the Re-Hit Angle Count.

NOTE: If the attempted rundown is a Re-Hit, it will not be reported or recorded.

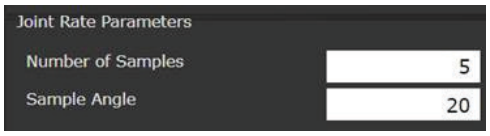
Re-hit Reject Enable: Enables the feature.

Re-Hit Reference Torque: This torque value is the start of the angle count that determines a Re-Hit. (This value should be lower than the In Cycle Torque specified in the PSet.)

Re-Hit Angle Count: If the angle count between the Re-Hit Reference Torque and the In Cycle Torque is less than this value, the rundown is determined to be a Re-Hit.

Joint Compensation Ratio: Adjusts the target torque of the tool to compensate for joint characteristics. This value has an inverse relationship with the target torque (Output torque = Target Torque / Ratio). Ratio values above 1.0 result in a lower output torque where values below 1.0 result in higher output torques.

Joint Rate Parameters: Joint rate parameters have default settings of 5 samples every 20 degrees. This resolution can be adjusted if needed.



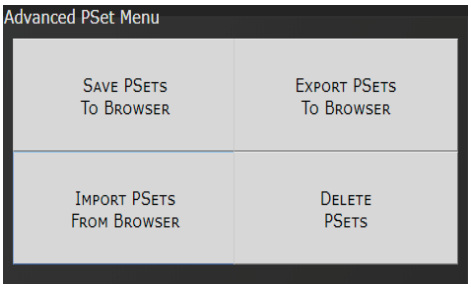
Report Trigger Loss as NOK: If enabled and a rundown is terminated early before completion:

- The overall result of the rundown will be reported as a reject.
- The torque and angle status will be reported as evaluated with the following exception:
  If torque and angle are both within limits, the torque and angle status will both be reported as low. This is done to further indicate that the rundown was terminated before completion.

4.2.5 Default Psets

See "3.2 Quick Set Up" on page 7

4.2.6 Manage PSets



Save PSets to Browser
Allows the PSet information to be saved to the local PC connected to controller. PSet information is saved as a .txt file and can be opened using any text editor such as WordPad. It can also be opened with Excel. The format of the .txt file is tab separated values.

Export PSets to Browser
Save the PSets as a database file to the PC connected to controller. These PSets can later be imported to another controller.

Import PSets from Browser
Import previously exported PSets to controller.

Delete PSets
Enables deletion of selected PSets.

4.2.7 Multistage Rundown Evaluation and Reporting

If a rundown cycle completes, or is terminated early while in or after the final audit stage of the PSet:

- The overall evaluation of the rundown will be determined using the torque and angle limits set in the final audit stage.
- The peak torque and angle achieved during the rundown, are used for the evaluation and reported.
- The torque and angle status, and overall result reported, will reflect this evaluation.

Note: The fastening torque must achieve the In-Cycle torque value set in the PSet for the rundown to be evaluated or reported.

If a rundown is terminated early before reaching the final audit stage:

- The overall result of the rundown will be reported as a reject.
- The torque and angle evaluation will be determined using the limits set in the stage that was running when the rundown was terminated.
- The torque and angle at the point in time when the rundown was terminated, is used for the stage evaluation.
- The torque and angle status reported will reflect this stage evaluation with the following exception:
  - If torque and angle are both within limits of the stage that was running, or if the stage was a non-audit stage, the torque and angle status will both be reported as low. This is done to further indicate that the rundown terminated before reaching the final audit stage.
- The peak torque and angle achieved during the rundown will be reported.

Note: The fastening torque must achieve the In-Cycle torque value set in the PSet for the rundown to be evaluated or reported.

Unfastening Stage special considerations:

- Rundown Back-Off multi stage PSet (Unfastening as the last stage)
  - If the unfasten stage is set to 'Non Audit':
    - The peak torque and angle reported from the fastening portion of the rundown will be used for the evaluation and reported.
  - If the unfasten stage is set to 'Audit':
    - The final torque and angle in the unfastening direction, at the point in time when the run cycle completes or is terminated, will be used for the evaluation and reported.
    - The final torque and angle will be reported as negative in the unfastening direction.
    - If the rundown cycle is terminated before reaching the final unfastening audit stage, the final torque and angle values will be reported as zero and the torque and angle status will be reported as low.
- Rundown Back-Off Rundown multi stage PSet (Unfastening as a middle stage)
  - The value for peak torque in the forward direction, will be reset to zero when tool begins an unfastening portion of the rundown.
  - If the rundown is terminated during the unfastening stage, the final torque and angle values will be reported as zero and the torque and angle status will be reported as low.

Torque Averaging Stages (AC_TA and AC_TCOMP) reporting exception:

- If a torque averaging stage fails to complete, or is the final audit stage, and the peak torque is less than the high torque limit, the final torque reported will be the torque average during that stage.

Torque and angle measurement details:

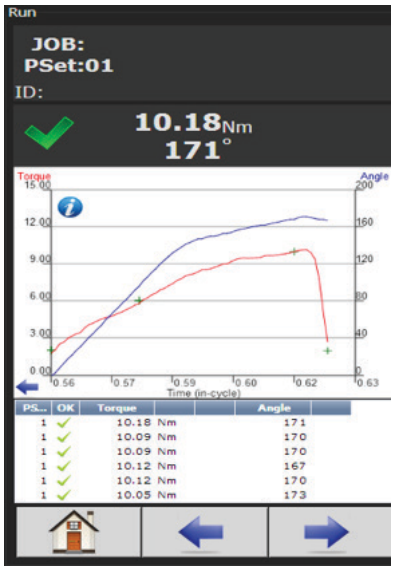
- Peak Torque is used for the overall evaluation and reported:
  - The peak torque achieved, from the start of the rundown to the when the torque falls below the cycle complete value set in the PSet
- Torque is used for the stage evaluation:
  - The torque at the point in time when the stage was terminated or completed
- Peak Angle is used for the overall evaluation and reported:
  - The peak angle achieved, measured from the angle reference set in the final audit stage, to the when the torque falls below the cycle complete value set in the PSet
    Note: If an angle reference is not defined in the final audit stage, the angle is measured from when the torque first crosses the In-Cycle torque set in the PSet.
- Angle is used for the stage evaluation:
  - The angle at the point in time when stage was terminated or completed, measured from the angle reference set in the stage.
    Note: 'Audit Stages' are stages that have torque and angle limits defined. These stages include:
    - TC Stage
    - TC_AM Stage
    - TC_AC Stage
    - AC_TM Stage
    - AC_TA Stage
    - AC_TCOMP Stage
    - Unfastening Stage (If Audit is selected)

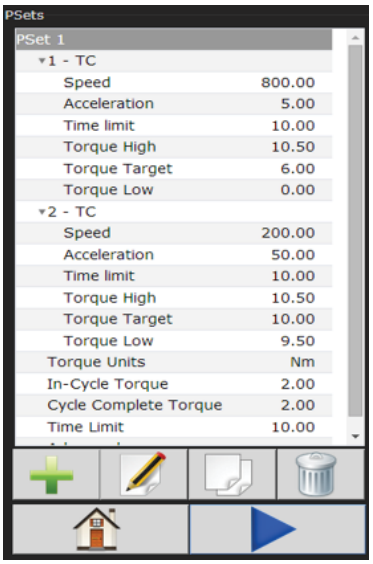
Note: If the evaluation of any stage during the rundown fails, or a bail out limit is exceeded, the fastening cycle will be terminated early and any subsequent stages will not run.

4.2.8 Multiple Stage Rundown Examples

EXAMPLE: Two-stage rundown with downshift

This example shows a typical two stage rundown with a higher first stage free speed and slower down shift speed to minimize overshooting of the target torque.

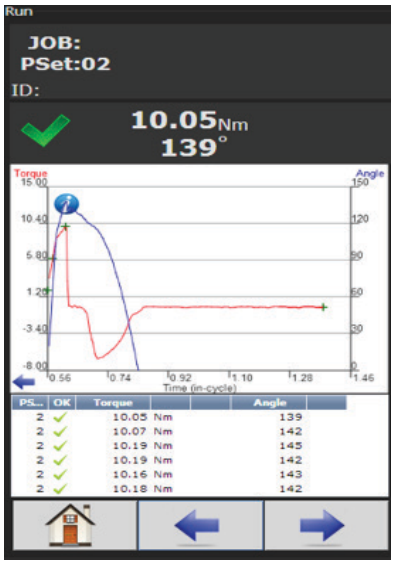


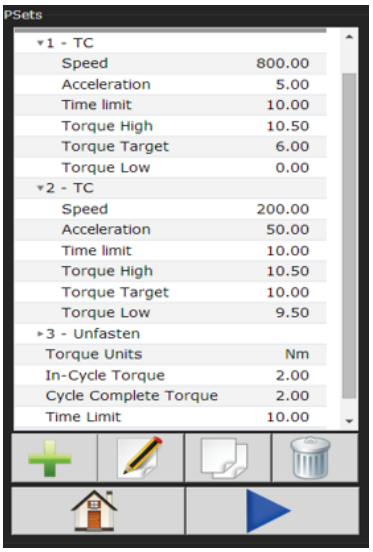


EXAMPLE: Three stage rundown with unfasten on the last stage. (Rundown Back-off)

This example shows a typical three stage rundown with a back-off stage at the end of the rundown.

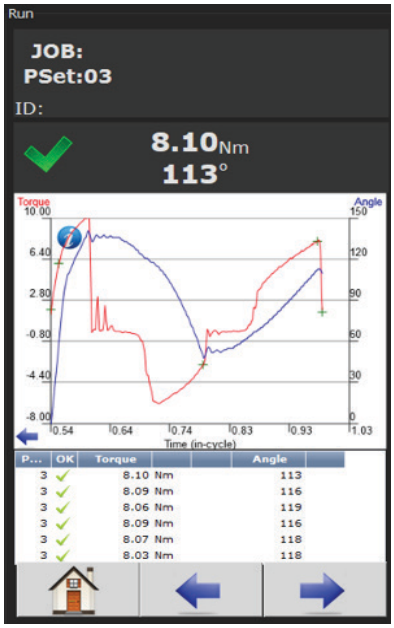
NOTE: The unfasten stage's audit parameter is set to false, therefore, the torque and angle reported are from the fastening portion of the rundown.

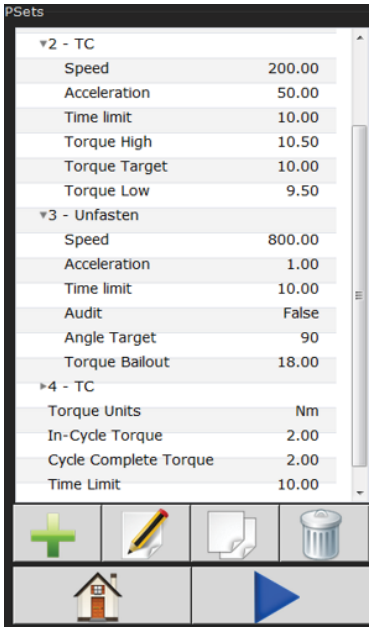




EXAMPLE: Four stage rundown with an unfasten stage in the middle. (Rundown back off Rundown)

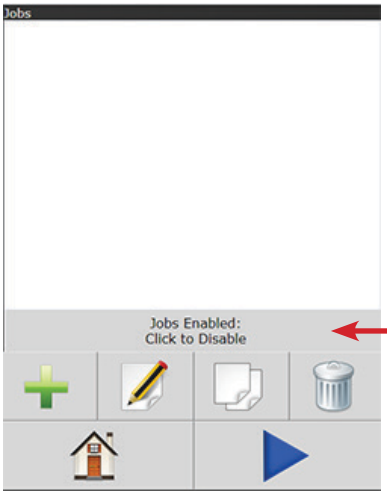
NOTE: The peak torque was reset at the start of the fastening stage. The torque reported was from the final stage.





4.3 Job

A Job is a collection of PSets which can be run when performing multiple fastening operations on a single application.



Jobs provide:

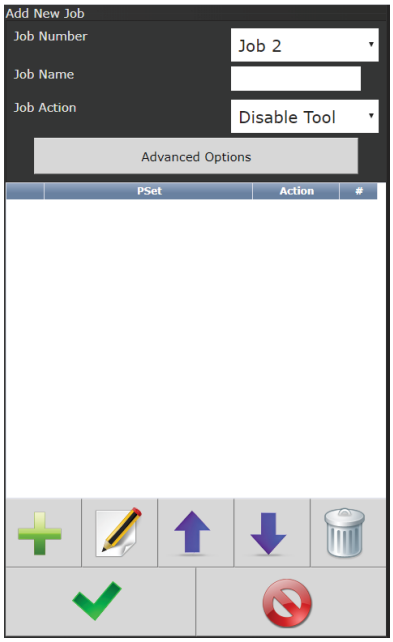
- Error proofing
- Logical grouping of PSets
- Fastening order
- Job status

Click to Enable/Disable Job function.

4.3.1 Add New Job

To add a new Job press JOB on the Home Page.

Press + on Jobs screen (above) to enter Add New Job screen (below)



Job Number: Up to 99 Jobs can be configured.

Job Name: Enter Job Name

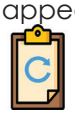
Job Action:

- **Disable Tool:** Disable tool after job is finished. Job complete Icon will appear.

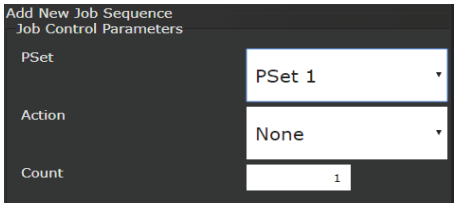
  Tool will not operate until job is reset.

- **Reset Job:** Will reset after Job is finished. Once Reset Job is finished, the following icon appears:

  This means that results from the last successful rundown of a job are cleared. Information from last successful rundown can still be accessed in the Results screen (see "4.4 Results" on page 33).

After appropriate values are entered, press + to go to Add New Job Sequence screen.



PSet: Choose any current PSet already configured in controller

Action:

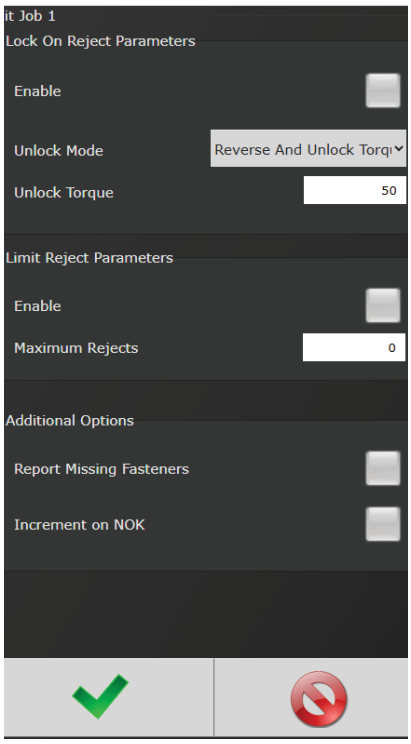
- **None:** Will stay in current sequence.
- **Next:** will advance to next sequence set up after count is reached.

Count: Fastener number required to complete sequence.

Once values are entered press ✓ two times to return to Job screen

4.3.1.1 *Advanced Options*

Enter Advanced Options ADVANCED OPTIONS if needed



Lock on Reject Parameters:

- **Enable:** When enabled, this prevents tool from starting a new rundown if the result of the last rundown was a reject. Tool remains locked until one of the four Unlock Mode conditions are satisfied.

Unlock Mode:

- **Reverse:** Running tool in disassembly mode.
- **Reverse and Throttle:** Running tool in disassembly mode.
- **Reverse and Unlock Torque:** Exceeding "Unlock Torque" while tool is in the disassembly direction (backing off a rejected fastener).

- **Any MFB Press:** Pressing MFB button on tool (regardless of MFB configuration).
- **External I/O:** Assignment of "Remove Lock on Reject" will allow for an external Input signal to release the lock condition.

Unlock Torque: If Unlock Mode is set to "Reverse and Unlock Torque", this torque value must be exceeded when the tool is in the disassembly direction in order to unlock the tool.

Limit Reject Parameters:
- **Enable:** Enable or Disable
- **Maximum Rejects:** Number of rejected fasteners allowed

Additional Options:
- **Report Missing Fasteners:** Add an option to each JOB that would allow us to report any missing fasteners. When it is set, the controller will report a NOK rundown for each fastener that is defined in the JOB but has not been run. These NOK results will be reported whenever a new job is started AND the prior JOB is incomplete.

  These generated NOK results are treated like any other fastening. They are displayed on the run screen, stored in the results and transmitted on all protocols.

- **Increment on NOK:** If enabled, the JOB will count NOK fastening toward the bolt count to complete the JOB.

4.3.2 Jobs "Enabled" Display and Button Function

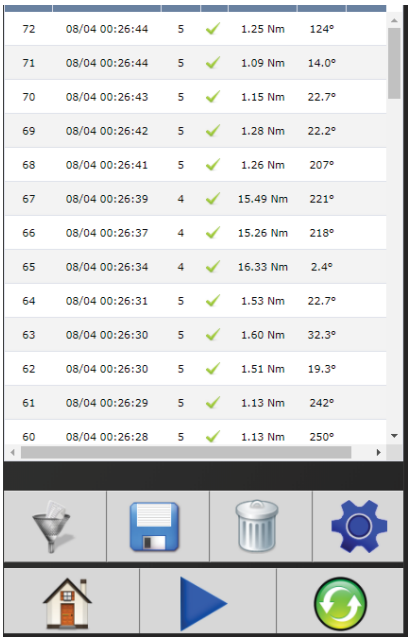
- Increment and Decrement buttons change the job sequence. The PSet number will change and job sequence number on secondary display will change if jobs are enabled.
- Holding the toggle button will display will display the Job number, while pressing increment or decrement buttons will change it. The two numbers on the PSet/Job display will be separated by decimals.
- Pressing the toggle button will change secondary display between:

  - Units of measure
  - Ethernet 1 IP address
  - Ethernet 2 IP address
  - System port IP address
  - Angle report
  - Bolt count
  - Job sequence

NOTE: Job sequence shows which PSet you are currently on in the job (this is not the pset number). The first pset in the job is always job sequence 1, and the next is 2, etc.

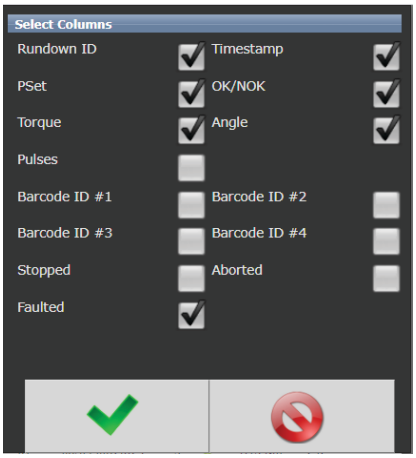
Bolt count is shown as current bolt count out of total number of bolts. Example: If you have 3 total bolts. When you start the job you will see 0.3. After one rundown you will see 1.3 and then 2.3 on the next run and so on until the job is completed.

4.4 Results



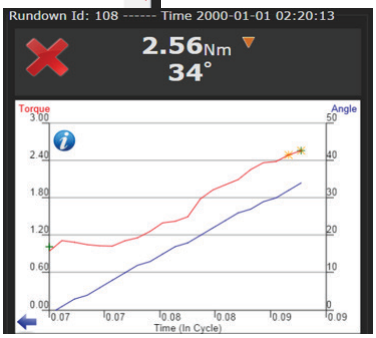
This screen provides a history of rundowns performed. Information such as ID Number, Time Stamp, Parameter Set#, Accept / Reject status, and Torque and Angle are recorded for each rundown.

	Filter Button gives filter options in Rundown screen.
	Save Button saves rundowns as .Txt File.
	Deletes individual rundowns by clicking on them
	Select Columns Button lets you customize the columns shown on the Results Screen
	Home Button returns to main display menu.
	Play Button sends you directly to Run Screen.
	Refresh Button refreshes screen to include latest rundowns.



Click on Individual Runs for Rundown information.

Example: Rejected Rundown Information.

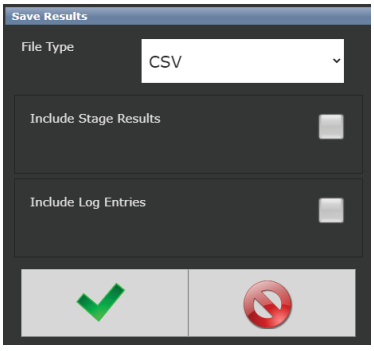


4.4.1 Saving Rundown(s)

Saving All Rundowns

Click on in main rundown screen to view/save total rundowns. A dialog box will open that allows you to choose the download format, either a CSV file or a TW4 file. The CSV file includes rundown data in tab separated variables and can be viewed using Excel or opened it text editor such as Notepad. The raw data can be imported to Excel to build graphs, charts etc. Contact AIMCO Technical Service for pre-made Torque and Angle Templates.

The TW4 file can be opened using the ACE Platform G4 Utility located on the software page of the AIMCO website.



The dialog box also shows options for including stage results or log entries in the downloaded file. If downloading a TW4 file, all information will be automatically selected.

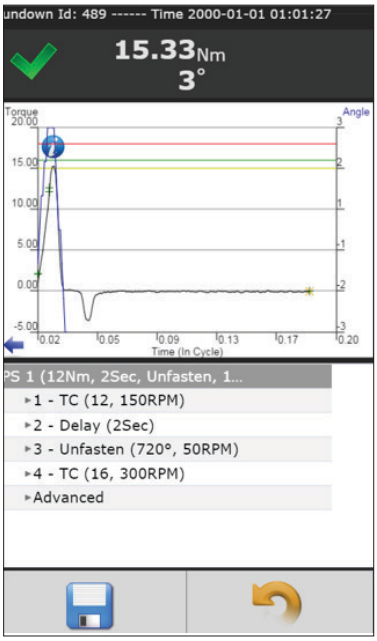
Click and your browser will download the file.

Saving Individual Rundowns

To save an individual rundown, select a rundown from the Results screen.

This opens the Rundown Information View. Click on  in save the rundown. The file will automatically download as a CSV file.

Rundown Information View



Sample of Individual Rundown Information

1	Result	65	
2	Job Numb	1	
3	Job Name	Paramont	
4	Job Seque	1	
5	Bolt Coun	3	
6	Date	########	4:18:00
7	Master Ru	0	
8	PSet ID	59	
9	PSet Num	1	
10	PSet Name		
11	Tool Mod	AEN32030A	
12	Tool Seria	191111	
13	Torque	11.69	
14	Angle	57	
15	Pulses	0	
16	Torque St	P	
17	Angle Stat	--	
18	Pulse Stat	--	
19	Rundown	P	
20	Tool Cycle	1111	
21	ID1 ("ID #1	2.2E+10	
22	ID2 ("ID #2	4.86E+10	
23	ID3 ("ID #3")		
24	ID4 ("ID #4")		
25			
26			
27			
28	Curves		
29	Tick	Torque	Angle
30	0	0.02	0
31	1	0.02	0
32	2	0.05	0
33	3	0.04	0
34	4	0.09	0

HTTP Method for Retrieving and Saving Rundown Results

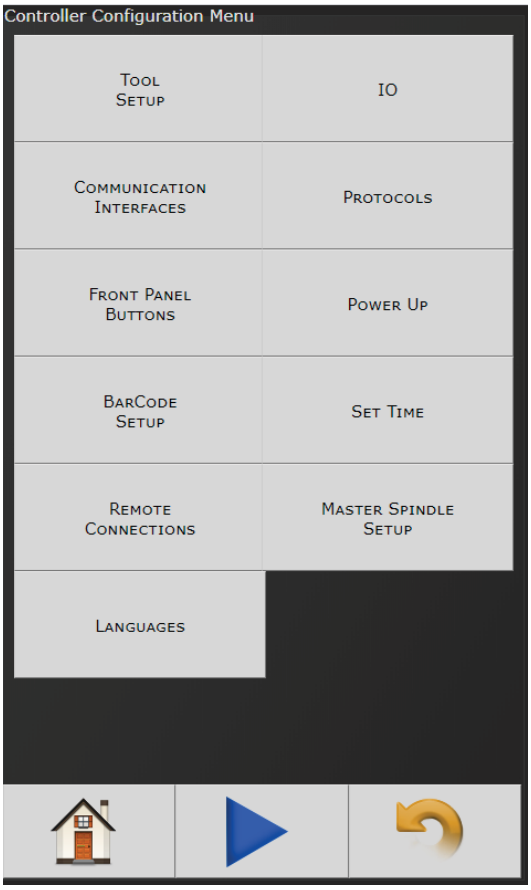
An http request to the controller for file "fastening.csv" (http://ipaddress/fastening.csv) will return the most recent rundown in the full rundown CSV format. This is in the same format as "Home->Results" selecting a results then selecting save.

Optionally, a specific ID can be selected. An http request to the controller for file "fastening.csv" with the optional parameter "id" set to the desired id number (http://ipaddress/fastening.csv?id=47) will return rundown id the full rundown CSV format.

The format can also be changed with the optional "version" parameter. An http request to the controller for file "fastening.csv" with the optional parameter "version" set to 1 (http://ipaddress/fastening.csv?version=1) will return a CSV file in the "QualityWorX File" format.

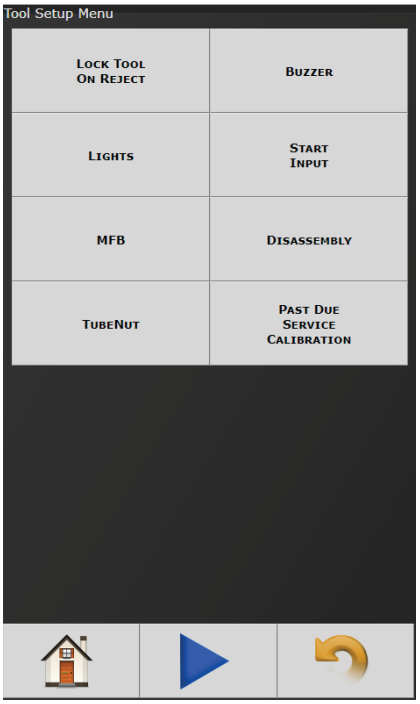
The "id" and "version" options can be used in any combination as needed.

4.5 Controller



The controller menu is where all of the settings for the Gen IV controller are configured. All of the different configuration capabilities are explained below.

4.5.1 Tool Setup



In this screen user can enable/disable various tool functions.

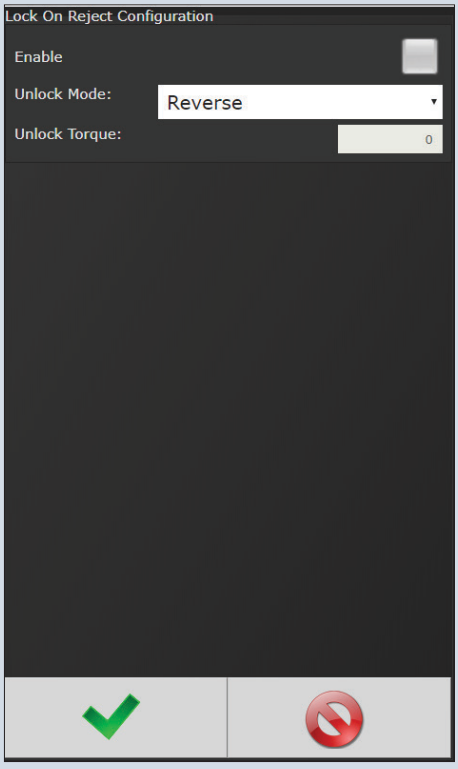
4.5.1.1 Lock Tool On Reject

When enabled, this prevents tool from starting a new rundown if the result of the last rundown was a reject. Tool remains locked until one of the four Unlock Mode conditions above are satisfied.

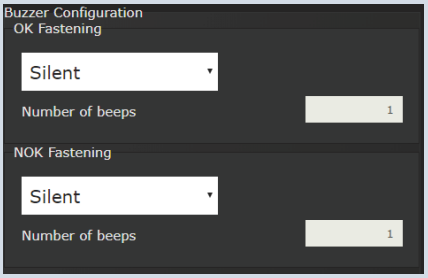
Unlock Mode: The action that re-enables the tool for use.

- **Reverse:** Running tool in disassembly mode.
- **Reverse and Throttle:** Running tool in disassembly mode.
- **Reverse and Unlock Torque:** Exceeding "Unlock Torque" while tool is in the disassembly direction (backing off a rejected fastener).
- **Any MFB Press:** Pressing MFB button on tool (regardless of MFB configuration).
- **External I/O:** Assignment of "Remove Lock on Reject" will allow for an external Input signal to release the lock condition.

Unlock Torque: If Unlock Mode is set to "Reverse and Unlock Torque", this torque value must be exceeded when tool is in the disassembly direction in order to unlock tool.



4.5.1.2 Buzzer

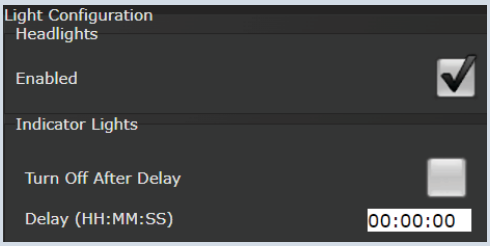


Set the way the buzzer behaves in OK/NOK situations. Menu options are

- Silent
- Constant
- Beep

If a rundown is rejected, the beeping can be stopped by making a successful rundown or by using the MFB.

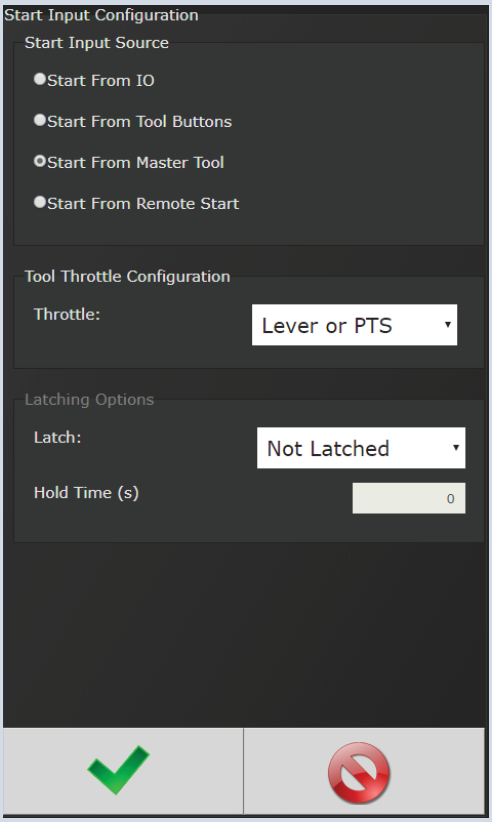
4.5.1.3 Lights



Headlight Enable: Enables or Disables the Headlight (pistol style tools only).

Turn off After Delay: Enabling will set the tool indicator lights to turn off automatically after a rundown is completed and the configured time has passed.

4.5.1.4 Start Input



Start from IO: Start tool through I/O from external source.

Start From Tool Buttons: Normal operating condition: Tool lever and MFB control tool operation.

Start From Master Tool: Used when one tool's start lever in the multispindle machine will be used as the start command for the entire system

Start From Remote Start: Used when the system start command would come over the Eth port connection

Tool Throttle Configuration: Four options are available:

- **Lever or PTS (Push to Start):** This the default configuration. Pressing either the Lever or PTS will start the tool.
- **Lever and PTS (Push to Start):** Both the Lever and the PTS need to be pressed in order to start the tool.
- **Lever:** Only the Lever will start the tool.
- **PTS:** Only the PTS will start the tool.

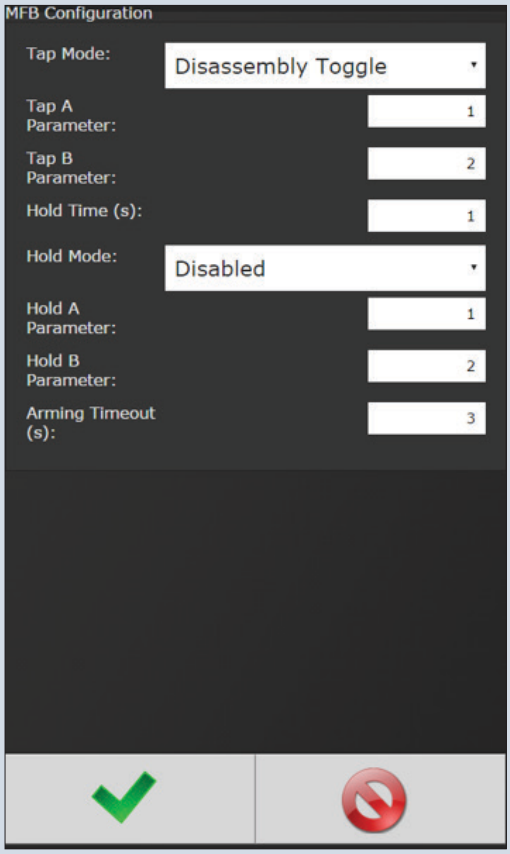
Latching Options:

- **Not Latched:** Start Input is not latched.
- **Latched on Time:** Start Input latches if lever is pressed for a set time.
- **Latched on MFB:** Latches on the following sequence:
  - Press and hold lever.
  - Press MFB while lever is still being held down.
  - Release the lever.
  - Release the MFB.

Latch Hold Time (s): Amount of time (in seconds) the lever needs to be depressed to latch throttle (if Latched on Time is selected above).

NOTE: Throttle will unlatch automatically at the end of the rundown or when the lever is repressed. If the tool is installed with dual levers requiring two-handed operation, the above Start Input Configuration settings will be ignored (see Dual Lever Two Handed Tools section).

4.5.1.5 MFB (Multi-Function Button)



The MFB Mode configures the multiple function button for handheld AcraDyne tools. The button can be configured to operate in any of the following modes:

Tap Mode: Actions will commence if MFB is held less than hold time.

- **Disabled:** MFB button will not work.
- **Disassembly Toggle:** Depress the MFB each time to switch between forward and reverse.
- **Disassembly One Shot:** Tool will automatically return to forward after fastening. The MFB will NOT have to be depressed for forward operation.
- **Change PSET:** Tapping MFB button toggles between PSet A and PSet B. Status lights flash once indicating PSET A is selected or twice indicating PSET B is selected.
- **Change Job:** Tapping MFB button changes jobs.
- **Arming:** Tapping MFB button arms (activates) the Start function but does not start the tool. Blue status light illuminates indicating tool is Armed. Arming resets in three seconds if tool Start is not initiated.
- **Stop Reject Tone:** Tapping MFB silences the audible reject tone.
- **Increment PSET Number:** Tapping MFB will switch upward to next PSet.
- **Increment Job Number:** Tapping MFB switches upward to next Job.
- **Increment Job Sequence:** Tapping MFB switches to next PSet in the current Job.

Tap A Parameter: Assign a specific PSet (Job) to the "A" parameter, toggle back and forth between "A and "B" parameters using MFB.

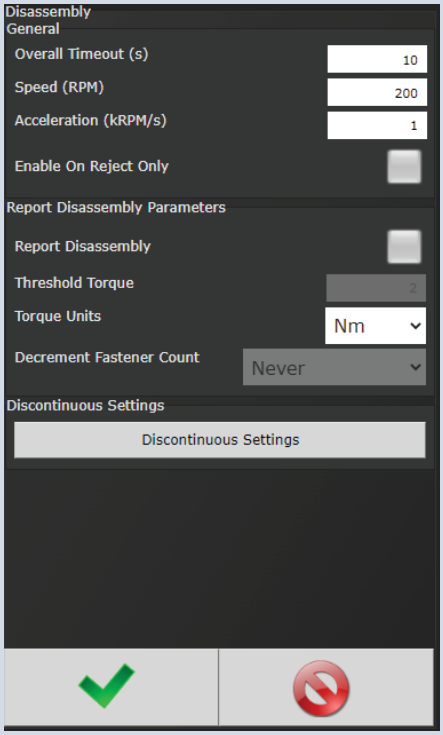
Tap B Parameter: Assign a specific PSet (or Job) to the "B" parameter.

Hold Time (s): Amount of time (in seconds) required to hold the MFB until Hold Action is triggered.

Hold Mode: Actions will commence after Hold timer preset time has elapsed (Adjustable in Hold Time window). Default value is one second.

NOTE: The same options are available in Hold mode as in Tap mode.

4.5.1.6 Disassembly



Overall Timeout (s): Total amount of time, in seconds, after throttle is depressed that tool will operate.

Speed (RPM): Maximum speed of the Output spindle.

Acceleration (kRPM/s): Rate at which tool is set to ramp up to maximum RPM.

Enable on Reject Only: If enabled, this option will only allow the tool to be placed in disassembly after a rejected fastening.

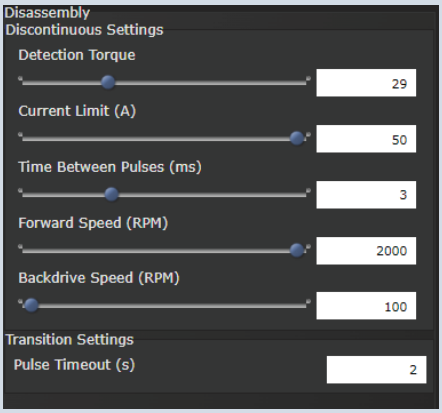
Report Disassembly: If enabled, disassembly events will be reported and logged.

Threshold Torque: Disassembly will be reported only if this torque value is reached. This is entered as a positive value.

Torque Units: Units for the Disassembly Threshold Torque

Decrement Fastener Count: If Disassembly is detected the fastener count in JOBS

- **Never:** Decrement count will be ignored
- **Always:** Decrement will always be active
- **Only after NOK:** Decrement only occurs after a tightening has been judged to be NOK (Reject)



Discontinuous Settings: For a description of these options, see "Discontinuous Mode Disassembly Parameters" on page 12

When a disassembly event is reported:
The disassembly will be displayed on the run screens and logged in the rundown record, containing the following:

- Overall evaluation will be marked as 'Disassembled' Peak torque during the disassembly (torque shown as negative).
- Peak overall angle during the disassembly (angle shown as negative).
- Curve data from the disassembly
- Parameters from the current PSet selected
- Fastening events from the disassembly.

All of the controller's status LEDs will be turned OFF. The LED display will show peak torque and angle as negative

I/O Considerations:
When disassembling, all assignable IO outputs that report rundown status will remain in the state from the last fastening cycle. This includes:

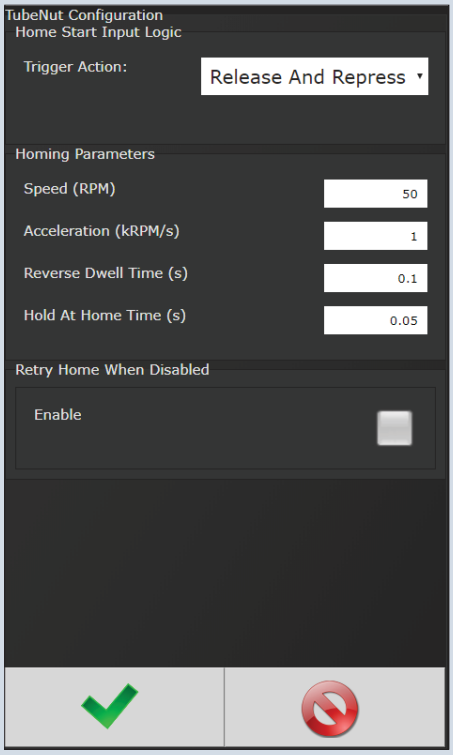
- Ok and Nok signals
- Torque/Angle high or low signals
- Torque and Angle Values

All assignable I/O outputs reporting a fasting events will not change state during the disassembly. This includes:

- Fastening Complete
- In Cycle
- Fastening Stopped
- Fastening Aborted

NOTE: When the tool is placed into disassembly mode, all of the tool's LEDs flash and the Horn beeps. This will continue until the tool is placed back into fastening mode.

4.5.1.7 Tubenut



Trigger Action: Two options are available

- **Release and Repress:** Socket will return Home on release and repress of main lever.
  NOTE: If the main lever is released while homing in this configuration the tool will stop and will continue to Home once the lever is repressed.

- **Release:** Socket will return Home upon release of main lever.

Speed (RPM): The speed in RPMs which a tubenut tool will return to the open position (default 50 RPM).

Acceleration (kRPM/s): Rate at which tool is set to ramp up to maximum homing RPM.

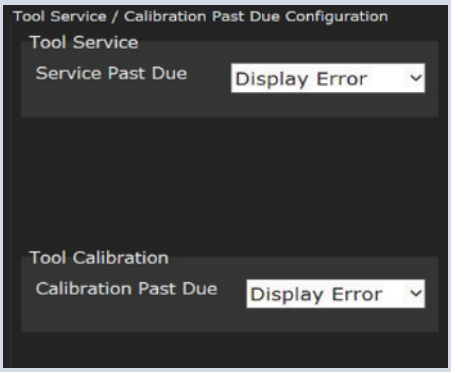
Reverse Dwell Time (s): Amount of time (in seconds) before Output attempts to return Home, after Home command is initiated (default 500ms).

Hold at Home Dwell Time (s): Amount of time (in seconds) Output is held at Home position (default 500ms).

Retry Home when Disabled:
This will allow a retry of the tube-nut homing sequence (by releasing then repressing the lever) even if the controller has been disabled or the stop input is on.

NOTE: Output is held at Home for the Home Dwell Time to prevent socket from bouncing back to partially closed position.

4.5.1.8 Past Due Service Calibration

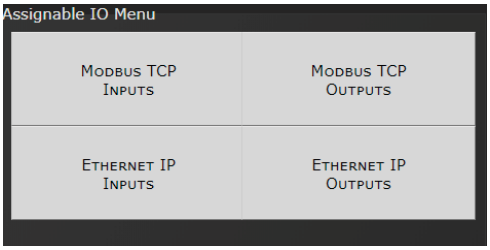


Service Past Due: Four options are available:

- **No Action:** No Action will be taken.
- **Log Error:** Errors will be saved on Service Log.
- **Display Error:** Calibration/Service message will appear on screen between each rundown. Tool remains functional.
- **Disable Tool:** Disable tool in preset Service period. Exceeded (date/time) LED warning appears on the controller.

Calibration Past Due: Same options as above

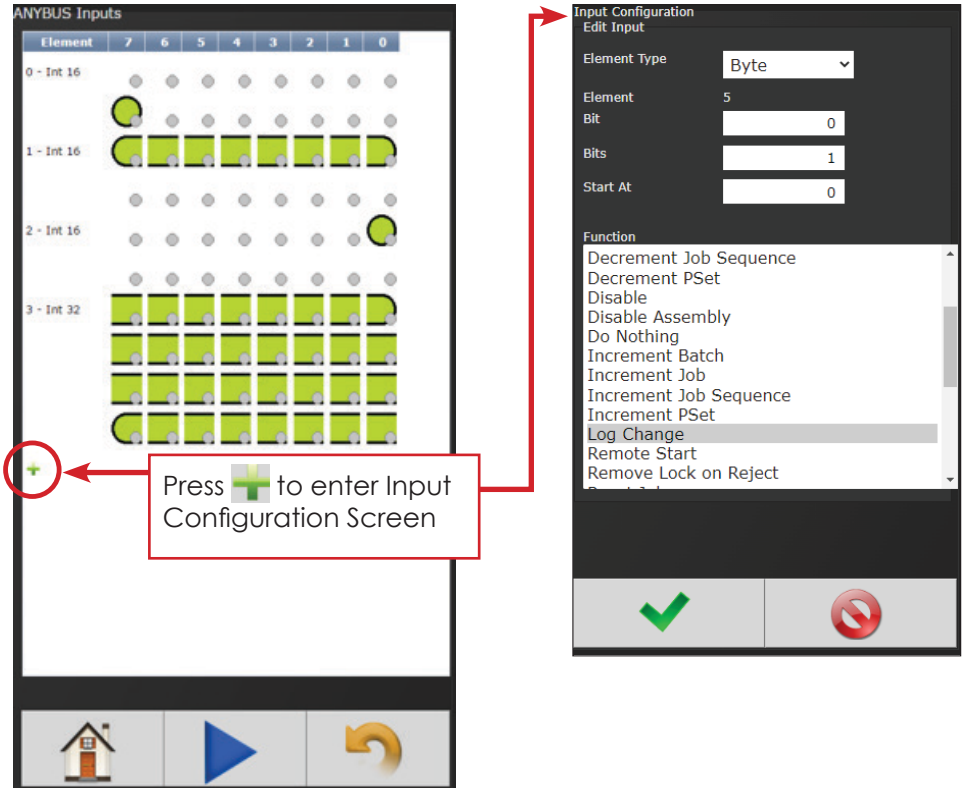
4.5.2 I/O



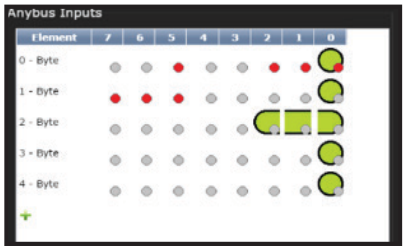
NOTE: See Gen IV IEC Manual section "11 Assignable I/O" for more detail on Input Functions.

4.5.2.1 Modbus TCP/Ethernet IP Inputs

These types of communication are useful for data communication between controller and PLCs. It is an effective, quick way for the data transfer of short data packages.



Example of the Anybus Input screen with five Inputs set up.



Click on to change an individual Element or return to Input Configuration screen.

Will delete individual Elements.

Element Type: Choose from Byte, Int16, Int32, or ASCII.

Element: Shows element # being configured

Bit (not shown): Enter Bit #.

Bits: # of bits the assignment will read.

Start at: Starting bit location.

Polarity (not shown): Select Normally Open (N.O.) or Normally Closed Outputs (N.C.).

Length (not shown, available in ASCII ID function): Number of characters desired to send.

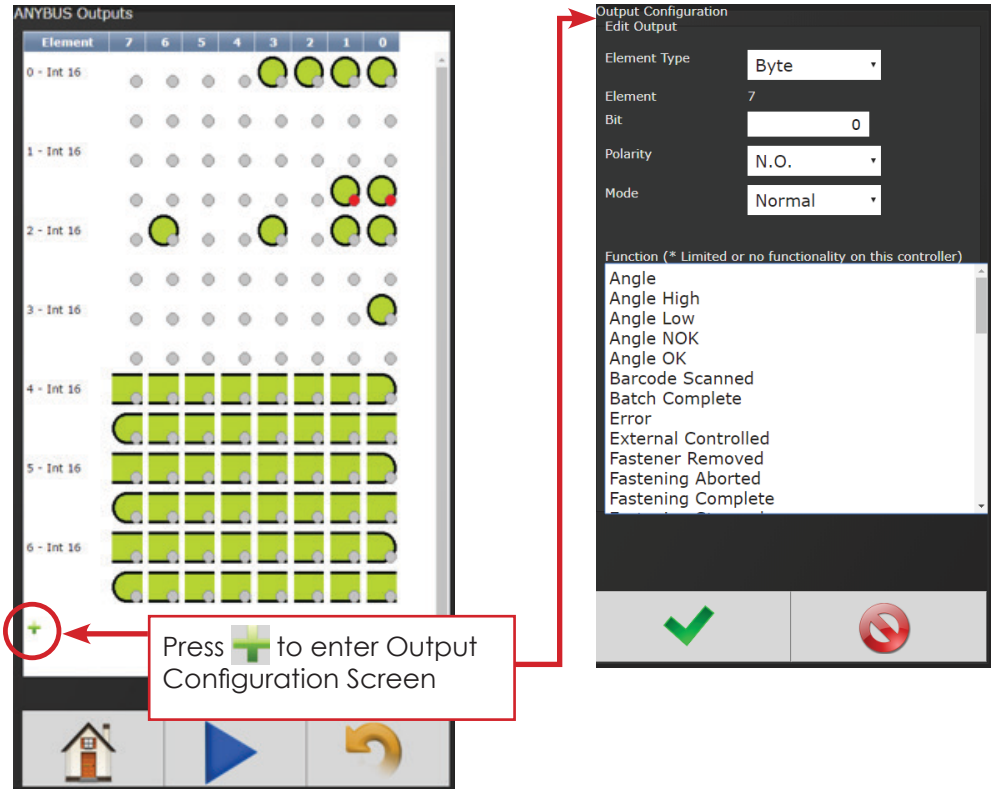
Torque (not shown, available in Click Wrench function): Torque value to be reported when using Click Wrench input. Value input is what will be sent from controller when Input Signal is received from a Click Wrench. ***Value is NOT calculated by the controller rather it is solely what the Click Wrench is calibrated to by outside means.***

Torque Units (not shown, available with Click Wrench function): Choose from Nm, Kgm, Kgcm, Ftlb, and Inlb.

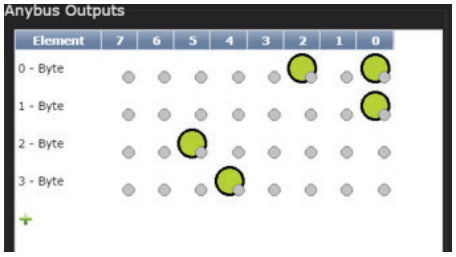
Function: Select desired Input Function(s). See Gen IV IEC Manual section "11 Assignable I/O" for more detail on Input Functions.

Click on after appropriate selections are made.

4.5.2.2 *Modbus TCP/Ethernet IP*



Example of the Anybus Output screen with five Outputs set up.



Click on to change an individual Element or return to Input Configuration screen.

Will delete individual Elements.

Outputs

Element Type: Choose from Byte, Int16, Int32, or ASCII.

Element: Shows element # being configured

Bit: Enter Bit #.

Bits (not shown)**:** # of bits the assignment will read.

Start at: Starting bit location.

Polarity: Select Normally Open or Normally Closed Outputs.

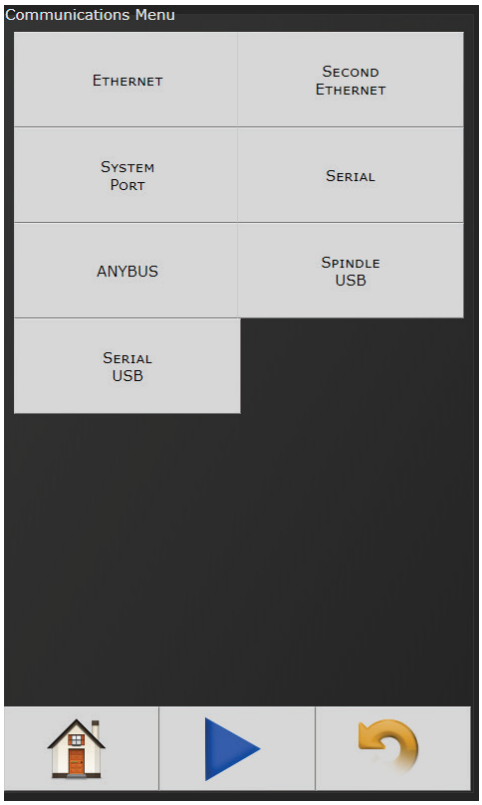
Mode:

- **Normal:** Output signal sent.
- **Timed Signal Sent:** Time entered in seconds
- **Flash Signal Sent:** Time entered in seconds

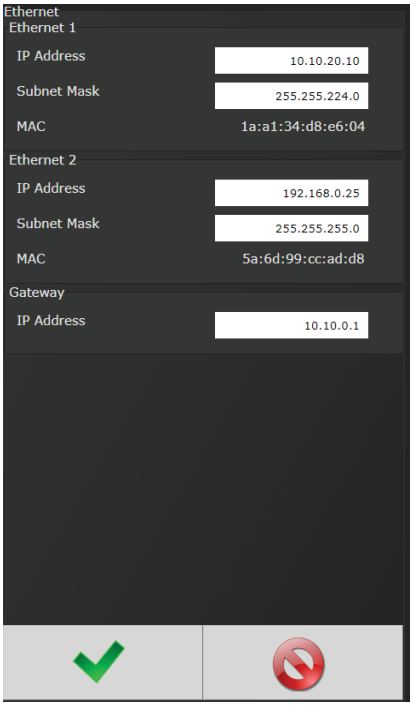
Function: See Gen IV IEC Manual section "11 Assignable I/O" for more details on assignable functions.

Click on after appropriate selections are made.

4.5.3 Communication Interfaces



4.5.3.1 Ethernet/Second Ethernet



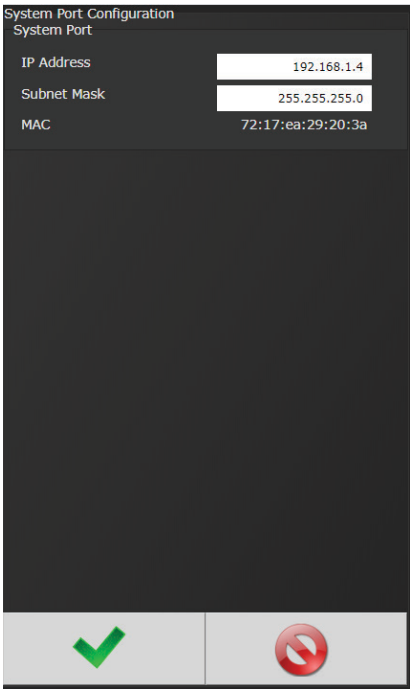
IP Address: IP address of controller's Ethernet port.

Subnet Mask: Subnet mask of the controller.

Gateway: Gateway is the IP address of the gateway computer that provides access beyond the local network.

NOTE: Consult your local System Administrator to connect the controller to your Network and assign IP addresses.

4.5.3.2 System Port

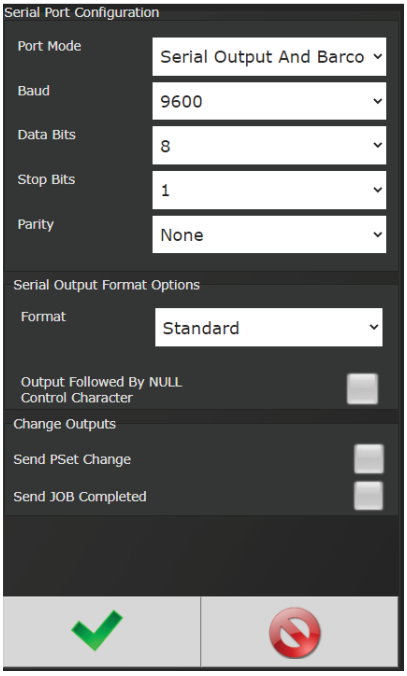


IP Address: The IP address of controller's System Port (Default is 192.168.1.4)

Subnet Mask: The Subnet Mask of controller's System Port.

NOTE: It is not recommended to change this setting.

4.5.3.3 Serial Port



Port Mode: The following modes are available:

- **Serial Output:** A serial data string will be Output in the following format after each rundown:
  - # P 1 BB TTT.T AAAA 0000 0000 J (Notice the decimal point next to the least significant T)

  - P: Parameter set (“1” – “9”) for PSets 1-9, (“A” – “W”) for PSets 10-32.
  - B: Job count
  - T: Torque result
  - A: Angle result
  - J: Judgment @=overall pass, H=low torque, I (eye)=high torque, J=low angle, K=high angle, G=fault during fastening
- **Barcode Reader:** See "5. Barcode Reader Details" on page 59 for Barcode setup.
- **Serial Output and Barcode Reader:** Select from dropdown and configure per hardware requirements
- **Open Protocol:** Select from dropdown and configure per hardware requirements
- **PFCS:** Select from dropdown and configure per hardware requirements
- **PI Line Control:** This is customer specific. Please reference PI Line Control Document on AIMCO Website/Manuals.

Baud: Serial ports can be configured for different baud rates available.

- 75, 110, 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200

Data Bits / Stop Bits / Parity: Configure per hardware requirements

Serial Output Formats: See "Serial Output Format Options" on page 44 for details.

- Standard
- Standard with PSet
- UEC Serial Modified
- Profibus
- UEC Serial
- CVS String

Output Followed by Null Control Character: Adds a one-byte NULL character to the end of the serial string. Needed by systems that use the NULL character to signify the end of the string. See following section for more information.

Send PSet Change

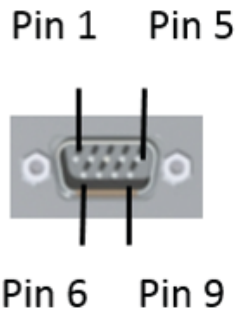
- Sends a serial string any time the PSet is changed. String is in the form ‘%%CAN8X%%%%CAN4YNAC%%’ where X is the previous pset and Y is the new pset. See following section for more information.

Send Job Completed:

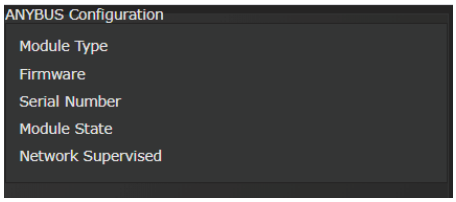
- Sends a serial string containing "Job Completed" whenever a job has been completed.

Gen IV Serial Port Pin-out

Pin	Signal
1	
2	RX
3	TX
4	DTR
5	GND
6	
7	
8	
9	

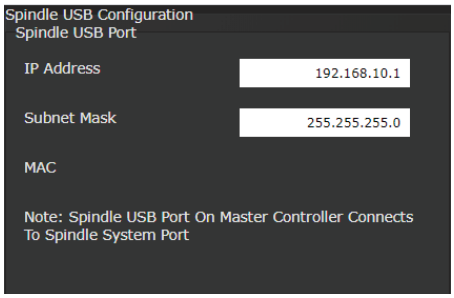


4.5.3.4 Anybus



Displays when the controller is AnyBus-enabled by hardware

4.5.3.5 Spindle USB Port



This can be used to set up a 2 spindle network through the USB port.

Serial Output Format Options

Standard Output Format:
- O P HHHHH LLLLL TTTTT P HHHHH LLLLL AAAAA CR CR NULL*
  - O: Overall Pass/Fail
    - 'P' = Pass, 'F' = Fail
  - P: Torque Pass/Fail
    - * 'P' = Pass, 'F' = Fail
  - HHHHH: Torque High Limit
    - Units selected in the PSet X10
  - LLLLL: Torque Low Limit
    - * Units selected in the PSet X10
  - TTTTT: Torque Result
    - Units selected in the PSet X10
  - P: Angle Pass/Fail
    - 'P' = Pass, 'F' = Fail
  - HHHHH: Angle High Limit
    - Degrees
  - LLLLL: Angle Low Limit
    - Degrees
  - AAAAA: Angle Result
    - Degrees
  - CR: Carriage return control character
  - CR: Carriage return control character
  - NULL*: Null control character (*if option is selected)

Standard Output with Carriage Return, Line Feed and PSet Format:
- O P HHHHH LLLLL TTTTT P HHHHH LLLLL AAAAA 1 CR LF NULL*
  - O: Overall Pass/Fail
    - 'P' = Pass, 'F' = Fail
  - P: Torque Pass/Fail
    - 'P' = Pass, 'F' = Fail
  - HHHHH: Torque High Limit
    - Units selected in the PSet X10
  - LLLLL: Torque Low Limit
    - Units selected in the PSet X10
  - TTTTT: Torque Result
    - Units selected in the PSet X10
  - P: Angle Pass/Fail
    - 'P' = Pass, 'F' = Fail
  - HHHHH: Angle High Limit
    - Degrees
  - LLLLL: Angle Low Limit
    - Degrees
  - AAAAA: Angle Result
    - Degrees
  - 1: PSet
    - PSet('1' – '9') for PSets 1-9, ('A' – 'Z') for PSets 10-35
  - CR: Carriage return control character
  - LF: Line feed control character
  - NULL*: Null control character (*if option is selected)

UEC Serial Modified Format (matches some Gen4 earlier versions):
- # P 1 BB TTT.T AAAA PPPP 0000 J CR NULL*
  - #: Message Start
  - P: PSet
    - PSet('1' – '9') for PSets 1-9, ('A' – 'Z') for PSets 10-35
  - 1: Spindle Number (Always 1)
  - BB: Job Bolt Count
    - Total number of accepts during the Job
  - TTT.T: Torque Result
    - Units selected in the PSet
  - AAAA: Angle Result
    - Degrees
  - PPPP: Pulse Count
  - 0000
  - J: Judgment
    - '@' = Overall Pass, 'H' = Low Torque, 'I' = High Torque, 'J' = Low Angle, 'K = High Angle, 'G' = Fault During Fastening
  - CR: Carriage return control character
  - NULL*: Null control character (*if option is selected)

Profibus Output Format:
- %CAN 1 O P HHHHH LLLLL TTTTT P HHHHH LLLLL AAAAA NAC% CR LF NULL*
  - %CAN: Message Start
  - 1: PSet
    - * PSet('1' – '9') for PSets 1-9, ('A' – 'Z') for PSets 10-35
  - O: Overall Pass/Fail
    - * 'P' = Pass, 'F' = Fail
  - P: Torque Pass/Fail
    - * 'P' = Pass, 'F' = Fail
  - HHHHH: Torque High Limit
    - * Units selected in the PSet X10
  - LLLLL: Torque Low Limit
    - * Units selected in the PSet X10
  - TTTTT: Torque Result
    - * Units selected in the PSet X10
  - P: Angle Pass/Fail
    - 'P' = Pass, 'F' = Fail
  - HHHHH: Angle High Limit
    - Degrees
  - LLLLL: Angle Low Limit
    - Degrees
  - AAAAA: Angle Result
    - Degrees
    - NAC%: Message End
  - CR: Carriage return control character
  - LF: Line feed control character
  - NULL*: Null control character (*if option is selected)

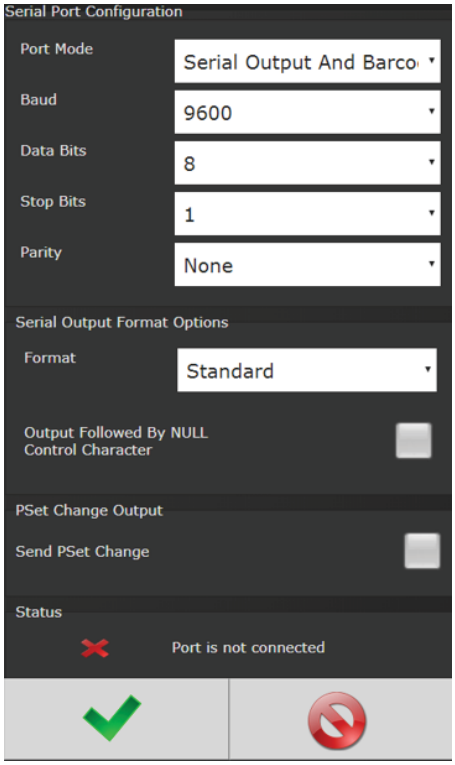
UEC Serial Format (matches UEC 4800 and Gen3):
- # 1 P BB TTT.T AAAA PPPP 0000 J CR NULL*
  - #: Message Start
  - 1: Spindle Number (Always 1)
  - P: PSet
    - * PSet('1' – '9') for PSets 1-9, ('A' – 'Z') for PSets 10-35
  - BB: Job Bolt Count
    - * Total number of accepts during the Job
  - TTT.T: Torque Result
    - * Units selected in the PSet
  - AAAA: Angle Result
    - * Degrees
  - PPPP: Pulse Count
    - L = Low Pulse Count, M = High Pulse Count
  - 0000
  - J: Judgment
    - * '@' = Overall Pass, 'H' = Low Torque, 'I' = High Torque, 'J' = Low Angle, 'K = High Angle, 'G' = Fault During Fastening, '*' = None of these conditions apply
  - CR: Carriage return control character
  - NULL*: Null control character (*if option is selected)

'CSV String'
- S01,JB01, TTT.T, S, AAA.A, S, O, MM/DD/YYYY HH:MM:SS, VVV<CR><LF>
  - S01: Spindle number
  - JB01: Job number
  - TTT.T: Torque
  - S: Torque Status (A = OK, H = High, L = Low)
  - AAA.A: Angle
  - S: Angle Status (A = OK, H = High, L = Low)
  - O: Overall Status (A = OK, R = NOK)
  - MM: Month
  - DD: Day
  - YYYY: Year
  - HH: Hour
  - MM: Minute
  - SS: Second
  - VVV: 32 character barcode ID
  - <CR>: Carriage Return
  - <LF>: Line Feed

'Output Followed by NULL Character'.
- The NULL characters can be seen by using PUTTY and connecting to the controller in 'Raw' mode. Then set logging to log all output and check the log to see the NULL characters.

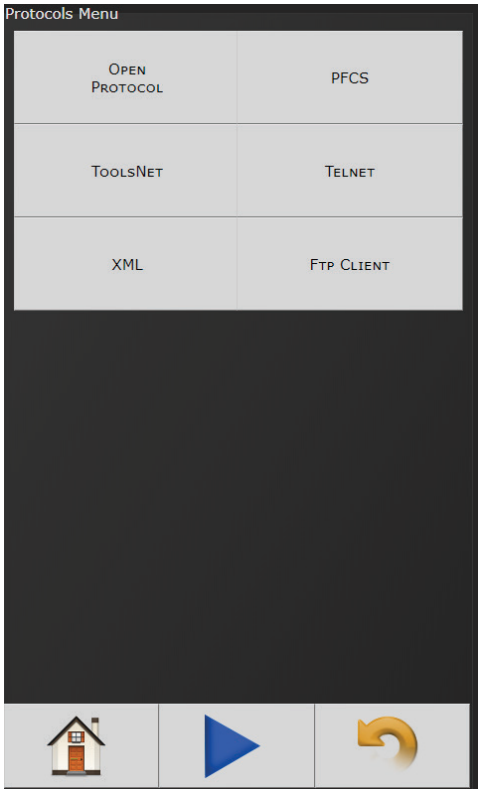
'Send PSet Change'.
- PSets up to 9 match the number, 10-35 are A-Z, greater than 35 is '*':
  - %%CAN8X%%%%CAN4YNAC%%
  - X: Last PSet
  - Y: New PSet

4.5.3.6 *Serial USB*



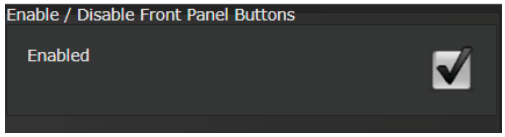
See "4.5.3.3 Serial Port" on page 42 for reference

4.5.4 Protocols



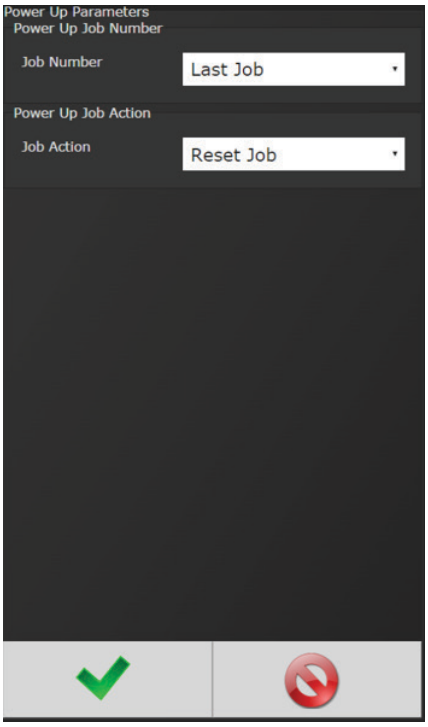
For information about these settings, see individual protocol instructions on AIMCO's website at www.aimco-global.com/manuals.

4.5.5 Front Panel Buttons



Enable/ Disable front panel buttons on controller console.

4.5.6 Power Up



Allows user several "Job" choices upon controller Power Up:

Power Up Job Number: Controller will power up on the job # selected.

- **Last Job:** When "Last job" is selected, controller will power up on last job selected prior to being Powered Down.

Power Up Job Action

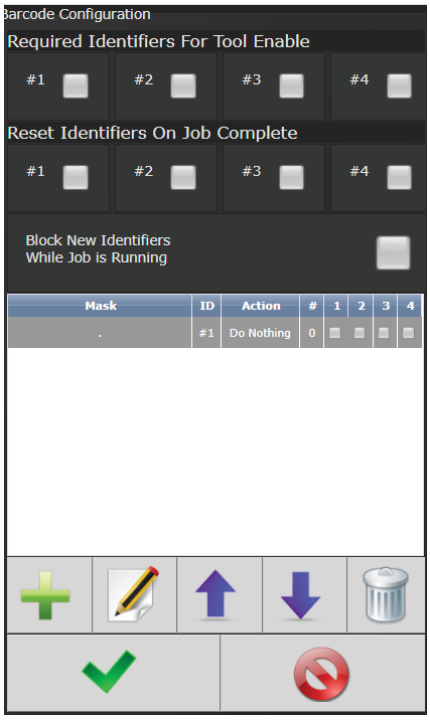
- **Reset Job:** Job will be reset when controller is Powered Up.
- **Wait for Job Reset:** Controller will wait for an External Job reset command upon Power Up and will retain job information existing prior to power down.
- **Resume Last Job:** Upon Power Up, tightening sequence will resume at the next fastening from the point in the job when power was shut down.

4.5.7 Bar Code Setup

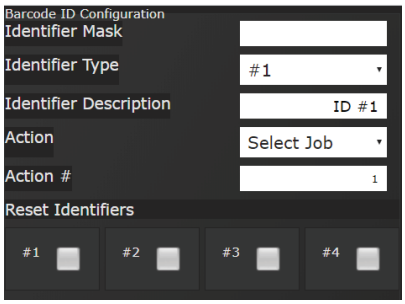
Required Identifiers for Tool Enable: Selects which four Identifiers (ID#1-4) are required to enable tool.

Reset identifiers for Job Complete: Selects which four Identifiers (ID#1-4) to reset on a job complete. Select Identifiers by clicking on them.

Block New Identifiers While Job is Running: Check to enable feature that ignores any barcode scanning while a JOB is in progress



Step 2: Enter appropriate information on Barcode ID Configuration Screen.



Identifier Mask: The Mask is a string used to compare the received barcode against. The received barcode must be at least as long in length as the Mask. The Mask can also contain "don't care" characters of a decimal point or period in the string. These characters are counted in the length, however, the actual received character in that position doesn't matter.

Example:

VIN#123456

Identifier Type: Identifies which identifier (ID#1-4) received barcode will be stored into.

Identifier Description: Text field can be used to give a description to each identifier type. (Example: Vehicle).

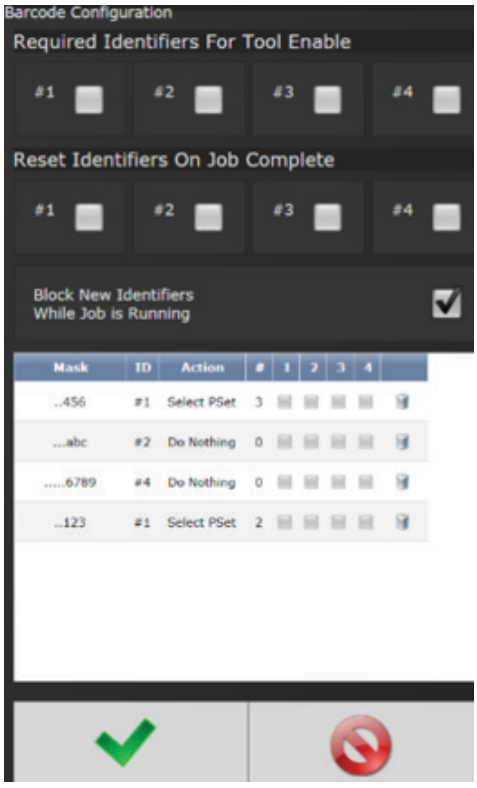
Action: Action executed by controller when barcode with a matching identifier mask is scanned. The actions are:

- Do Nothing
- Select Job (This will require a Job to be configured on the JOB page when using this option)
- Select PSet

Action #: When Select Job or Select PSet is selected, this is the number of the Job or PSet that will be selected.

Reset Identifiers: Can reset other identifiers (ID#1-4) when barcode is received. Click on identifiers to reset.

Step 3: Press  to save and re-enter completed barcode configuration screen.



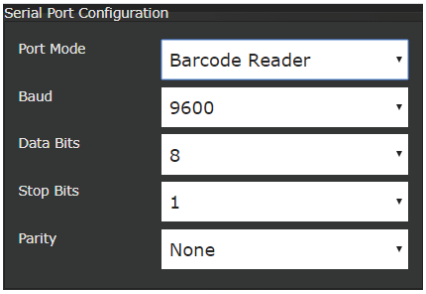
Click anywhere in body if additional identifiers are required.

Press  to save barcode configuration.

See "5. Barcode Reader Details" on page 59 for more information)

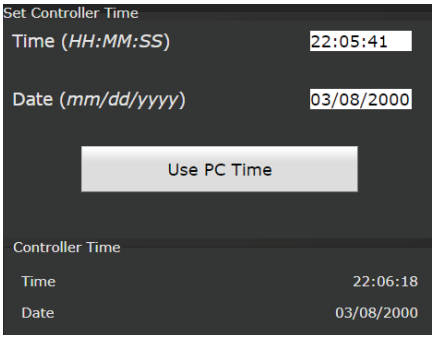
To configure Serial Port for Barcode Reader:
On Home page click Controller → Communication Interfaces → Serial

Select Barcode Reader and the correct Baud rate.



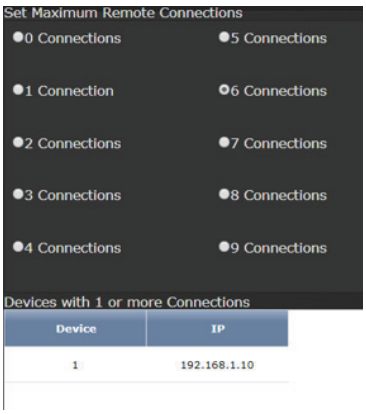
Press ✔ to save changes.

4.5.8 Set Time



Set time and date. If connected to a PC, use PC Time to set controller time.

4.5.9 Remote Connections

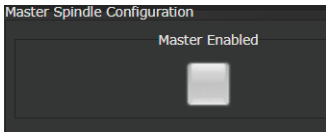


Sets number of remote browser connections to controller.

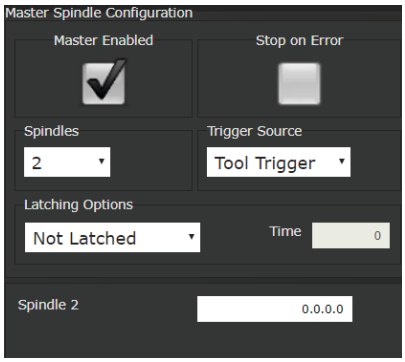
Displays the IP addresses of remote browser connections to the controller.

4.5.10 Master Spindle Setup

Several Gen IV controllers can be linked together via an Ethernet connection to create a multi-spindle network. Operations requiring multiple fasteners to be inserted simultaneously or in a synchronized fashion is possible with this setup. Up to 10 tools can be operated from one master controller. The spindle network can be controlled via physical IO or across supported protocols. PSets will be synchronized across the spindle network so PSets and Jobs will only need to be set up on the master controller. Spindle rundown results are also viewable from the master.



Click "Master Enable" to enter Master Spindle Configuration screen.



Master Enabled: Enable or disable the spindle network.

Stop on Error: All spindles will stop if any problem is reported (bad rundown, a stop condition, or a cable disconnection has occurred on any spindle). If this option is not checked, spindles will finish the current rundown even if an error has occurred on one spindle.

Spindles: Use Dropdown to select number of Spindles to be connected in a Multispindle configuration

Trigger Source: Select whether the start input for running the spindle network comes from the master spindle's tool trigger, IO, or Remote Start.

*All spindles need to have their start input set to respond to the master tool in order to have them all run from a single trigger or IO start signal. This is configured under Controller → Tool Setup → Start Input and set the input source to 'Start from Master Tool'.

Latching Options: Select latching throttle option. If Latch on Time is selected, the spindle network will continue to run after the throttle has been held down for the selected amount of time.

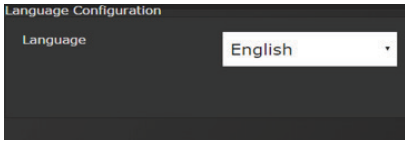
4.5.10.1 Setting up Multi-Spindle Network

See following page

4.5.11 Languages

Select from:

- English
- Chinese
- Japanese
- Korean
- Spanish
- Portuguese

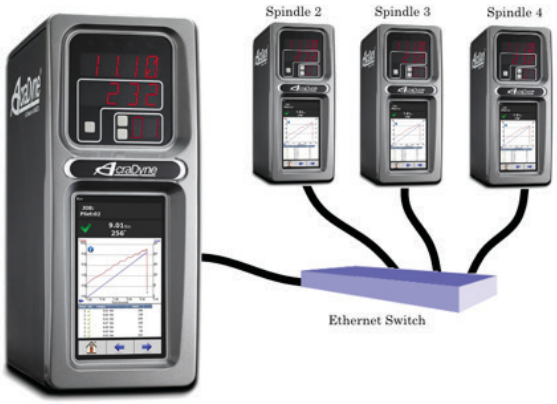


4.5.10.1 Setting up Multi-Spindle Network

Hardware
Connect the master controller and spindles together via an Ethernet switch. Ensure that all controllers have the appropriate tools connected and apply power.

Software
Steps to enable the multi-spindle network:

1. **Configure the IP address of each spindle:** Ensure that they are all on the same subnet.
2. **Set each controller to be controlled from the master controller:** Go to Controller → Tool Setup → Start Input and set the input source to 'Start from Master Tool'.
3. **Enable the master controller:** The configuration screen for setting up the master spindle controller is found under Controller → Master Spindle Setup. To begin setup, enable the master spindle by clicking on the red X under 'Master Enabled'. This will unroll several new options. Now set the number of spindles and add their IP addresses to the list. Click OK to add the spindles to the master controller. Clicking OK will synchronize PSets and time across the controllers.
4. **Add a PSet:** Once the PSet is saved then it is ready to be run.
5. **View the results:** Spindle network results can be found under the "Spindle Results" tab now appearing on the main menu. Clicking on a spindle result will show the results of each individual spindle.



Spindle IP Addresses: The number of spindles listed depends on the number of spindles enabled. Add the IP addresses of the spindles to add them to the spindle network.

PSets: Synchronizing Stages
When setting up a PSet, the Sync stage is available to synchronize spindle rundowns. Sync stages allows each spindle to pause between stages and wait for other spindles to reach the same stage before proceeding.

For example, a PSet set up to perform TC, Sync, Unfasten, Sync, TC will ensure that all spindles reach the target torque before going to the unfasten stage. At that time, all spindles will unfasten to the desired angle and will not proceed until each spindle has completed that stage before running down to the final torque. The rundown curve for this type of PSet is shown with four spindles.

49 Total Master Spindle Rundowns

ID	Time Stamp	Spindles	OK	ID Codes [1] [2] [
49	04-27 15:45...	1,2,3,4	✗	[] [
48	04-27 15:45...	1,2,3,4	✓	[] [
47	04-27 15:44...	1,2,3,4	✓	[] [
46	04-27 13:29...	1,2,3,4	✓	[] [
45	04-24 18:13...	1,2,3,4	✓	[] [
44	04-24 18:13...	1,2,3,4	✓	[] [

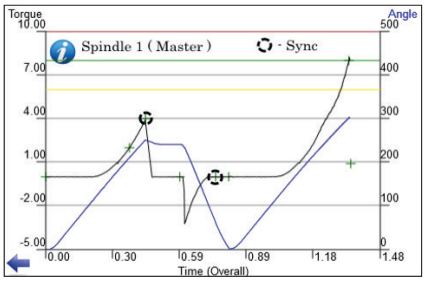
Clicking on a spindle result item will display results of each spindle used in the operation

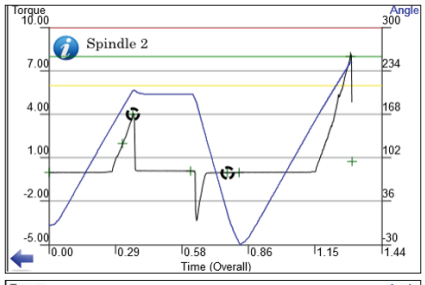
4 Spindle Rundowns

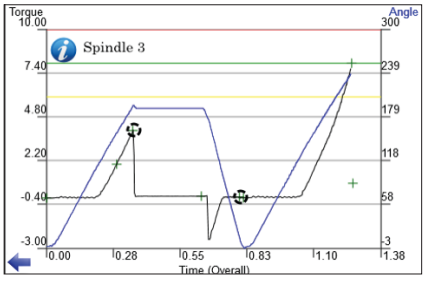
Spin...	Ok	PSet		Torque		An...	
1	✓	1	[4Nm, Sync, Unfast...	8.18 Nm	✓	95°	✓
2	✓	1	[4Nm, Sync, Unfast...	8.10 Nm	✓	114°	✓
3	✓	1	[4Nm, Sync, Unfast...	8.12 Nm	✓	83°	✓
4	✓	1	[4Nm, Sync, Unfast...	8.17 Nm	✓	58°	✓

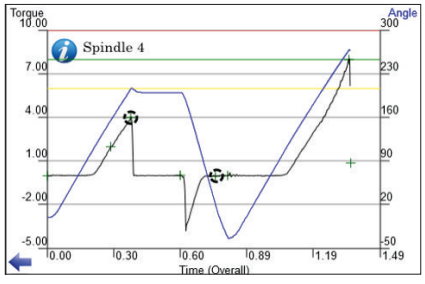
PSet with Sync Example

PS 1 [4Nm, Sync, Unfasten, Sy...
- 1 - TC [4, 100RPM]
- 2 - Sync [5Sec]
- 3 - Unfasten [180°, 200RPM]
- 4 - Sync [5Sec]
- 5 - TC [8, 100RPM]
- Advanced

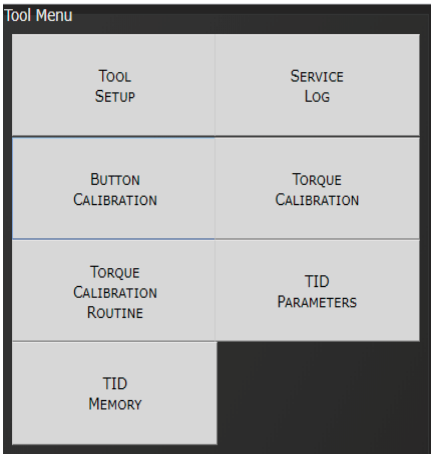




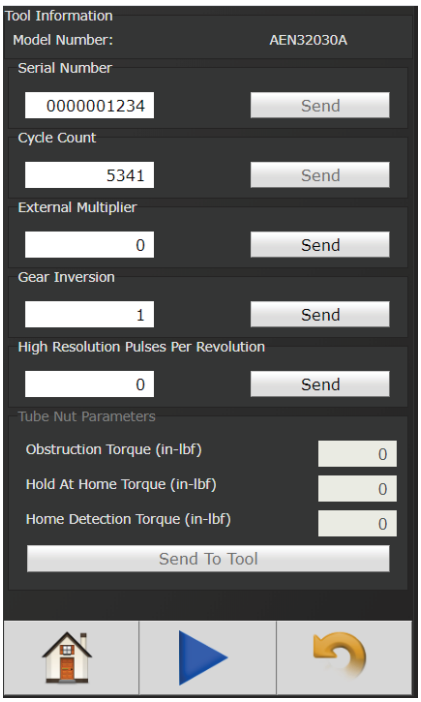




4.6 Tool



4.6.1 Tool Setup



Allows user to make changes to Tool Setup.

Model Number: Tool model number of tool connected to controller.

Serial Number: Serial Number of current tool connected to controller.

Cycle Count: Total number of cycles since last reset.

External Multiplier: Configures tool to include gearing added to the base model.
Units: Gear Ratio * 100 (Example: Adding a multiplier with a gear ratio of 5:1, Multiplier setting = 5).

Gear Inversion: 1 = tool Output rotates same direction as motor
–1= tool Output rotates in opposite direction as motor.

High Resolution Pulses Per Revolution: Determines resolution of the tool motor hall sensors

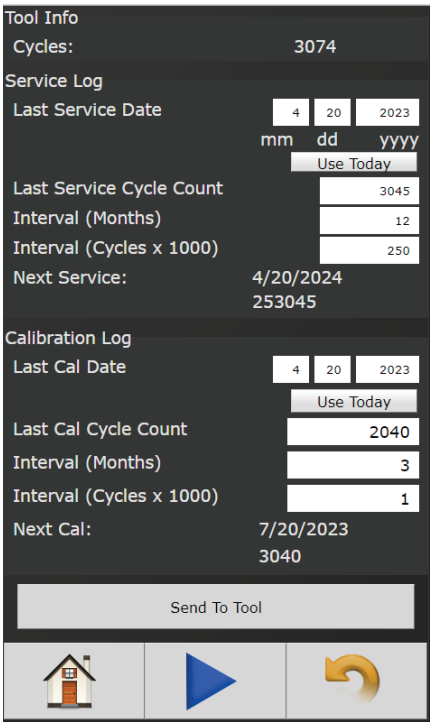
Tube Nut Parameters
See "13. Tubenut Tool Setup Details" on page 68 for more information

Obstruction Torque (in-lbf): First 90° of rotation in the fastening direction. Cycle will be aborted if this torque is exceeded. If the tool rotates 90° and stops without any obstruction, the value is too low.

Hold At Home Torque (in-lbf): After reaching the open position, this is the torque preventing socket from bouncing to a partially closed position. This torque should be set to a value slightly less than the tubenut Home torque.

Home Detection Torque (in-lbf): In the reverse direction, reaching this torque indicates to controller that socket is in open position. If socket does not attempt to return to open position, this value is too low. AcraDyne recommends starting at approximately 12 in-lbs.

4.6.2 Service Log

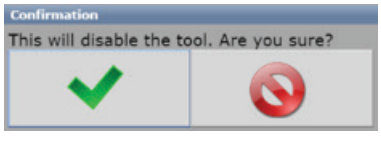


Service Parameters are stored in memory of tool and can be viewed in this screen. 'Next Service' or 'Next Cal' will turn red if value entered is exceeded.

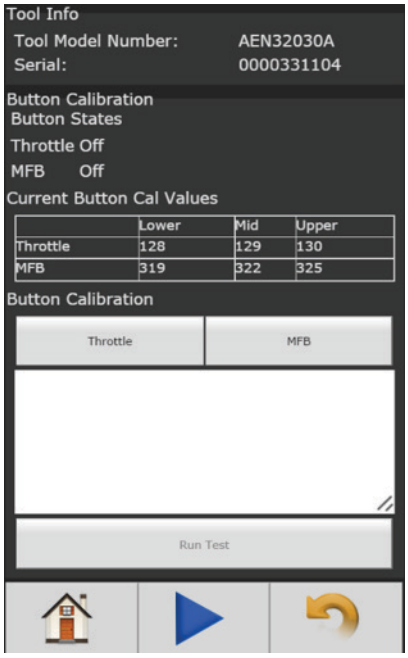
4.6.3 Button Calibration

After a tool has been worked on, it is possible the relationship between hall sensors and magnet have changed. Using the 'Button Calibration' screen calibrates the field between the two.

Select "Button Calibration" from the Tool Menu.

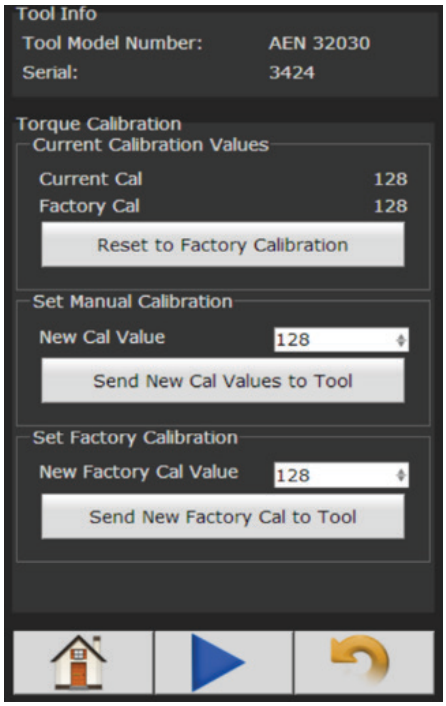


Tool disable confirmation screen will appear.



Test throttle and MFB (Multi-Function Button), send values to Tool ID board in this screen. Follow the on-screen instructions for button calibration.

4.6.4 Torque Calibration

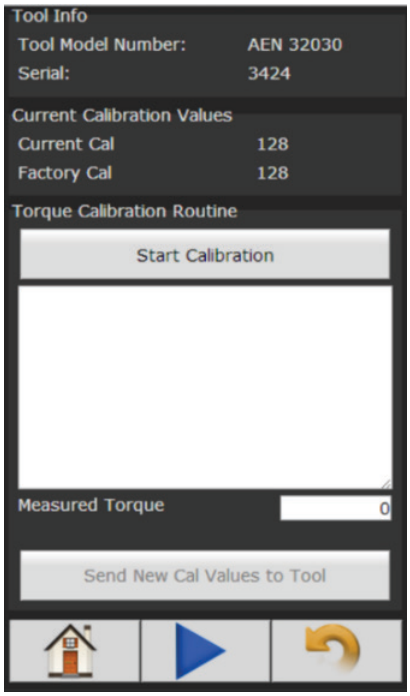


Manually calibrate and reset tool to Factory Calibration.

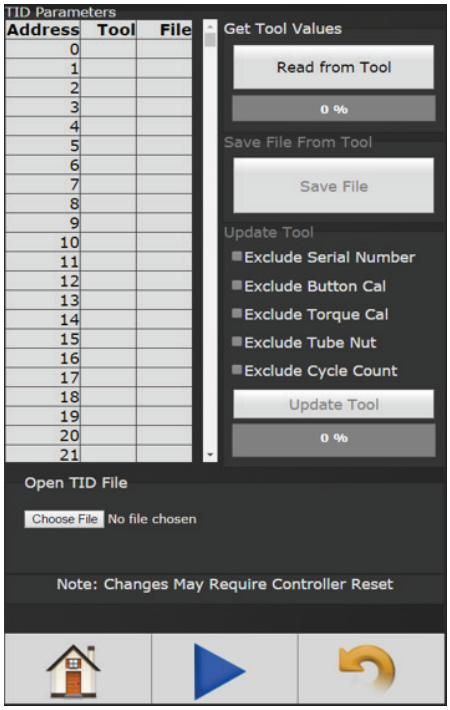
4.6.5 Torque Calibration Routine

Used to calibrate tool using a Master Transducer. The following are steps to calibrate tool.

1. Press the "Start Calibration" button.
2. Run Tool to Final Torque.
3. Enter external transducer (Master) value in Measured Torque box.
4. Press "Send New Cal Values to Tool" button.
5. 'New Cal' value is calculated automatically and assigned to tool ID Board.

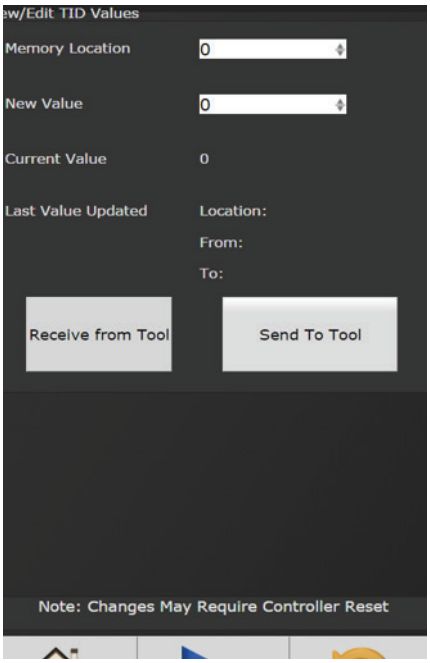


4.6.6 TID Parameters



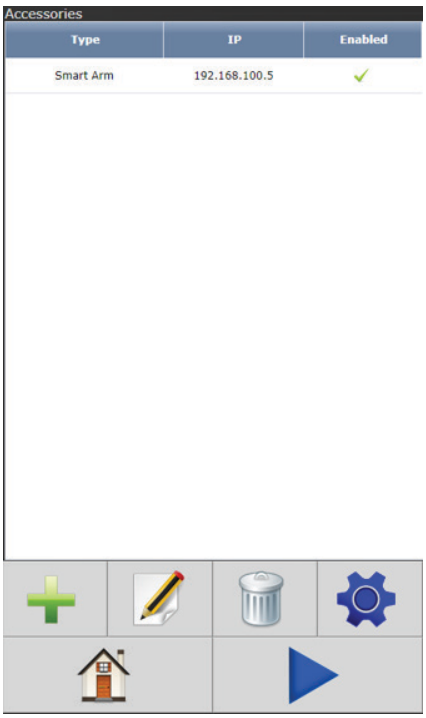
Used by factory to load Tool ID parameters into tool.

4.6.7 TID Memory



Allows a Qualified Service Technician to view or edit tool.

4.7 Accessories

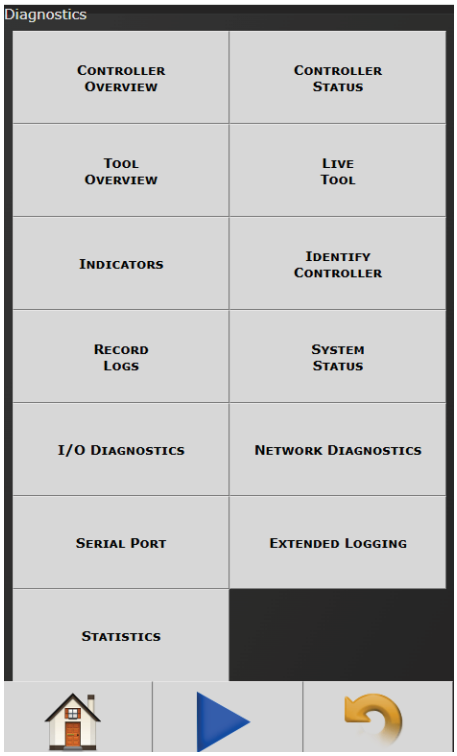


This screen shows accessories configured in the controller. New accessories can be added, edited, and deleted using the buttons at the bottom of the table. The gear icon navigates to the Accessory Scanning and Setup page.

The Smart Arm Accessory allows an articulated arm with encoders to be used with the Gen IV controller. Fastener locations can be programmed into the controller so that the controller will perform specific actions when the tool is located on a specific fastener.

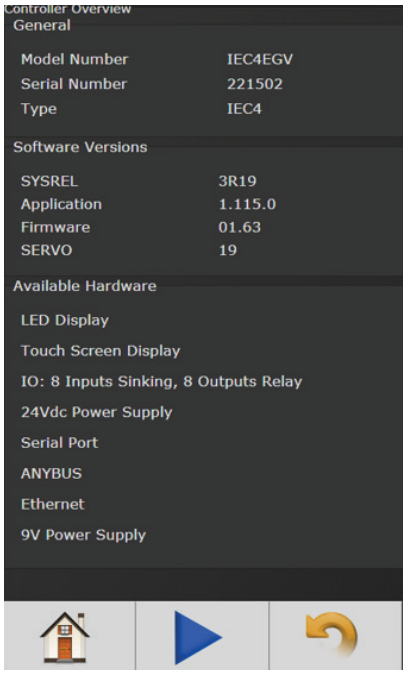
For more specific instruction contact: **AIMCO Technical Service, Toll Free 1-800-852-1368 or go to** http://www.aimco-global.com/manuals and download the **Gen-IV Controller Smart Arm Configuration Manual.**

4.8 Diagnostics



The Diagnostics menu contains all pertinent information regarding unusual behavior of the system. Detailed descriptions are given in the following sections.

4.8.1 Controller Overview



Model Number: Model Number of the controller.

Serial Number: Serial Number of the controller.

Type: Type of controller:

- **IEC**: Intelligent Electric Controller
- **IEC4W:** Intelligent Electric Controller 4 Mobile

SYSREL: System Release # shown

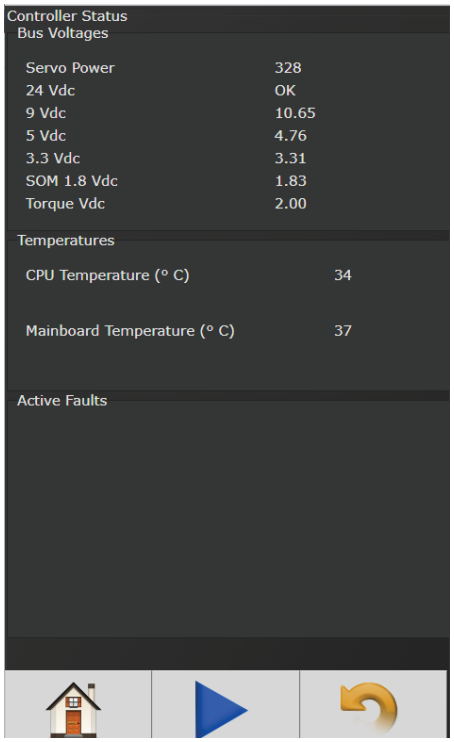
Application: Current Application software version.

Firmware: Current Firmware software version.

Servo: Current Servo Drive

Available Hardware: Available hardware on the controller.

4.8.2 Controller Status



Shows "Live" status of controller, voltages, active faults, and temperature.

Bus Voltages: Alarm icon will appear on controller console and under "Active Faults" (see below) if any of these values are out of range:

- **Servo Power:** Live monitoring of power demand from tool to controller
- **24 Vdc:** Represents voltage from 24V power supply. Value is reported as on or off (.0-24.0 volts) and is for external use via 24V I/O port.
- **9 Vdc:** Represents voltage from 9V power supply powering Tool electronics.
- **5 Vdc:** Represents voltage from 5V power supply powering controller electronics.
- **3.3 Vdc:** Represents controller electronics internal 3.3V Bus voltage.
- **SOM 1.8 Vdc:** Represents controller electronics internal 1.8V Bus voltage
- **Torque Vdc:** Status indication of tool transducer voltage

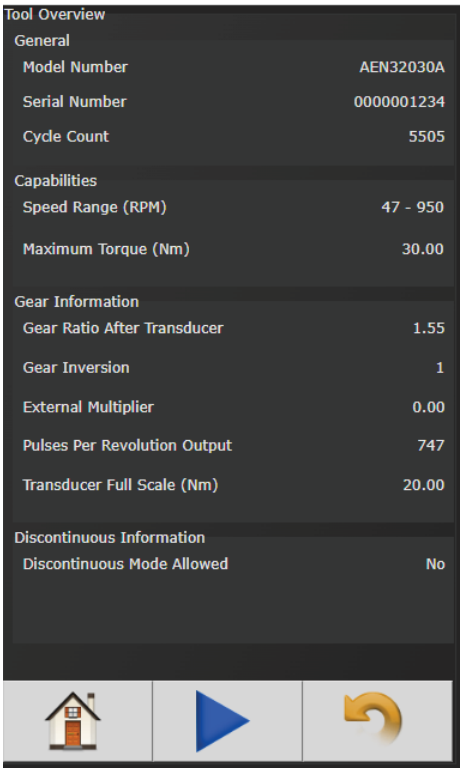
CPU Temperature (° C): Represents temperature of CPU measured in Celsius.

Mainboard Temperature (° C): Represents temperature inside controller measures in Celsius.

Active Faults: Any tool/ controller faults will be shown in this area.

4.8.3 Tool Overview

This "read only" screen gives an overview of the tool connected to the controller. The information is stored in the memory on the Tool ID board (TID).

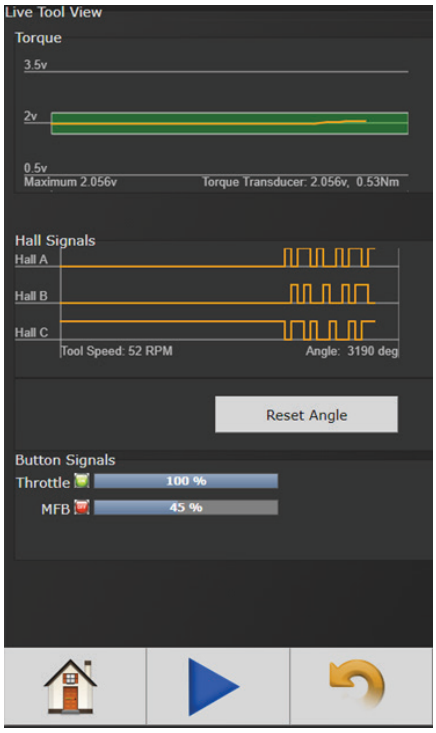


- **Model Number:** Model number of tool connected to controller.
- **Serial Number:** Serial number of tool connected to controller.
- **Cycle Count:** Number of fastening cycles tool has performed since counter was reset.
- **Speed Range (RPM):** Free speed of tool output.
- **Maximum Torque (Nm):** Maximum torque output of tool.

The following information is used internally by AcraDyne Technicians and not generally relevant to the end user:

- **Gear Ratio After Transducer:** Any gearing between transducer and tool output.
- **Gear Inversion:** 1= Tool Output rotates same direction as motor. -1= Tool Output rotates in opposite direction as motor. (Example: Tube nut tools typically show -1 for gear inversion)
- **External Multiplier:** Gear ratio of external "after market" multiplier.
- **Pulses Per Revolution Output:** Number of motor hall pulses that occur per one revolution of motor Output.
- **Transducer Full Scale (Nm):** Full scale torque rating of transducer.
- **Discontinuous Mode Allowed:** Yes or No

4.8.4 Live Tool

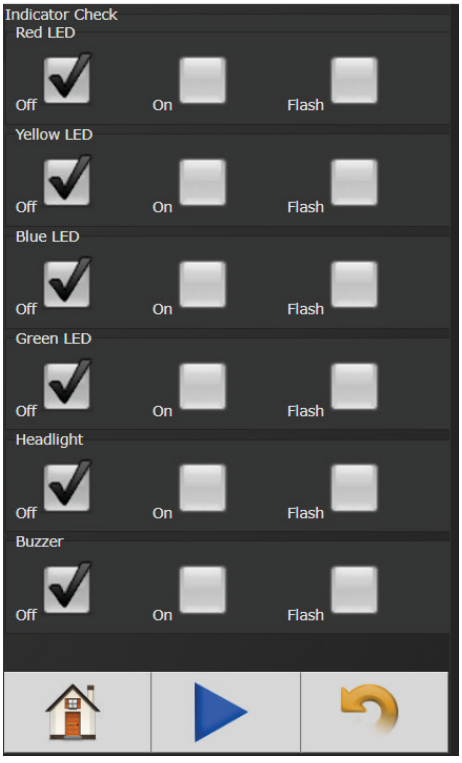


Torque: Shows a live view of tool transducer in volts and Nm. Voltage will be approximately 2.0 volts (± 0.005 Vdc) when tool is at rest and torque is zero (verify the voltage is within the green zone in the graph).

During a rundown, tool transducer voltage increases as torque increases.

Motor Hall sensors A, B, C will be monitored along with tool throttle, Multi-Function Button, and RPM. The Hall Signals chart displays the live angle value. This value is set to zero when navigating to/out of the live tool screen. The "Reset Angle" button resets the live tool angle counter.

4.8.5 Indicators

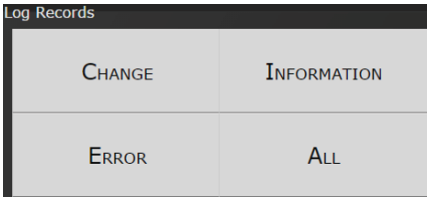


Allows user to test tool LEDs, headlight, and buzzer.

4.8.6 Identify Controller

'Identify Controller' will cause lights on controller and tool to flash making the system easy to locate. This is especially helpful when programming is being done and multiple controllers are being used in close proximity to each other.

4.8.7 Record Logs



Logs information describing usage of controller and tools that have been used with that controller.

4.8.7.1 Change Log

Log displays changes made to tool or controller.

4.8.7.2 Information Log

Log displays all information entries.

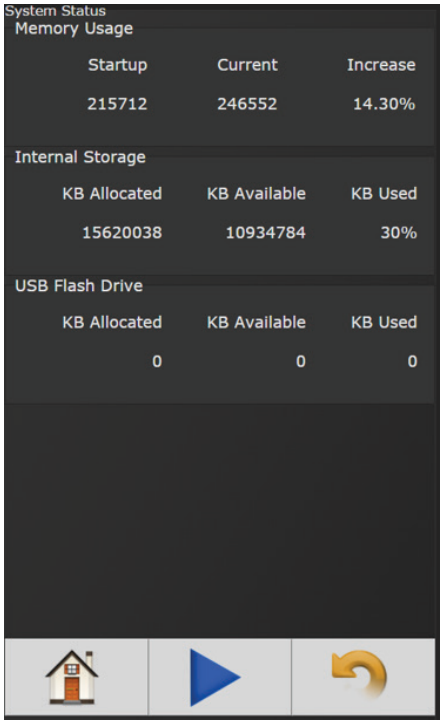
4.8.7.3 Error Log

Log displays ONLY Error Entries.

4.8.7.4 All

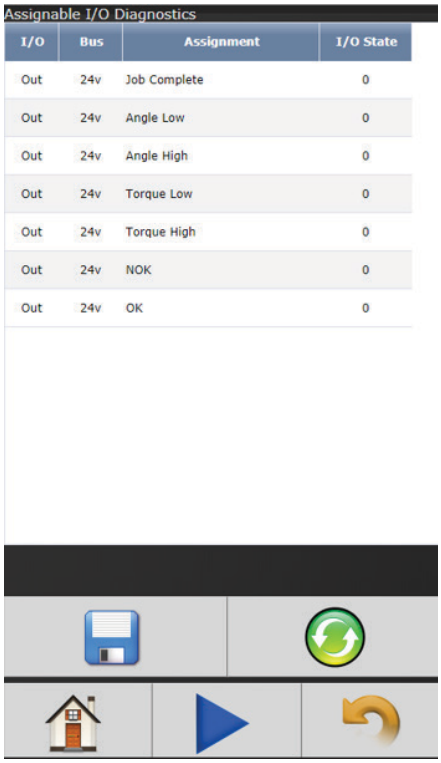
Displays all Changes, Information and Error entries.

4.8.8 System Status



4.8.9 I/O Diagnostics

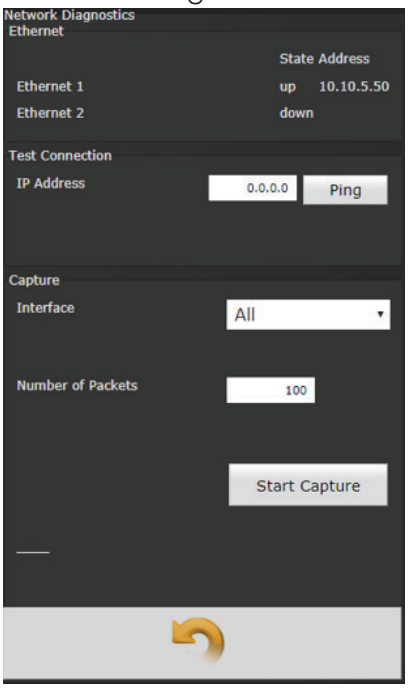
The I/O Diagnostics screen shows a log of all IO state changes from any assignable input or output. This can aid in verifying the correct functionality for IO configuration.



The refresh button will update the screen with the most recent IO changes.
The save button will generate a log file that can be viewed on a PC. This file can be downloaded when viewing from a PC or saved to a USB drive when using the controller touch screen. This saved CSV file contains much more detailed information (timing, IO settings, etc) than can be displayed on the controller screen.

4.8.10 Network Diagnostics

Network Diagnostics can be useful in troubleshooting Ethernet communication issues

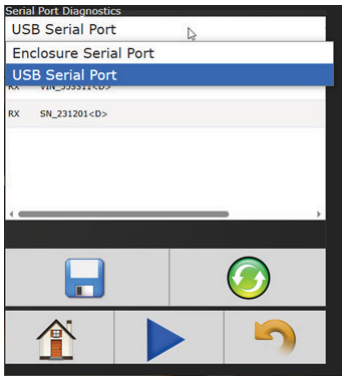


Ethernet: Shows if the Ethernet port is physically connected and if the hardware is operational.

Test Connection: Provides a way to check the ethernet connection to other devices on the same network.

Capture: Captures and saves the ethernet traffic for evaluation

4.8.11 Serial Port Diagnostics



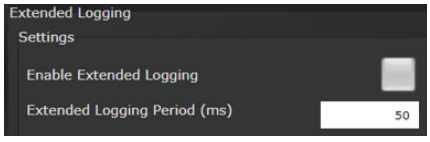
The Serial Port Diagnostics page shows all serial communications coming in and out of the controller. Select between Enclosure Serial Port (RS232/DB9 port) and USB Serial Port communications.

The Refresh button updates the screen with the most recent communications.

The Save button generates a log file that can be viewed on a PC and downloaded. This file can also be saved to a USB drive when using the controller touch screen. This saved CSV file contains a timestamped record of all communications since the last time the controller restarted.

4.8.12 Extended Logging

Extended Logging can provide more details to the rundown's curve data.



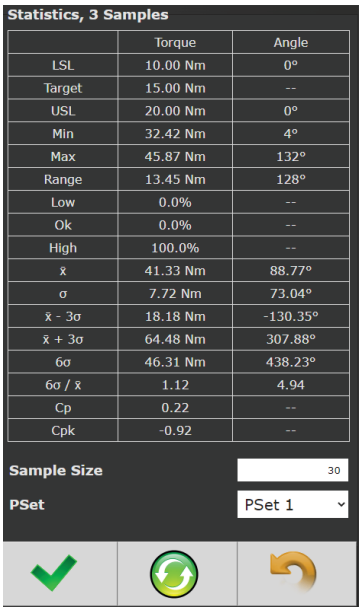
If Extended Logging is enabled, extra fastening events are logged in the curve data.

NOTE: Care should be taken when using this feature, as it will require more memory to store the curves and make the saved rundown records larger.

4.8.13 Statistics

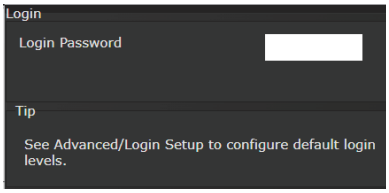
Enter the desired number of samples and PSET to observe calculated statistics. Number of samples must be equal to or less than the existing recent results stored within the controller. Statistics are presented as a courtesy to users who wish to review them in quick fashion on the controller screen.

The Lower Spec Limit (LSL) and Upper Spec Limit (USL) are the lowest and highest torque or



angle values that should occur in the audit torque or angle stage. By default, the audit torque or angle stage is the last auditable stage. This can be changed in PSet → Edit Stage → Audit Options.

4.9 Login

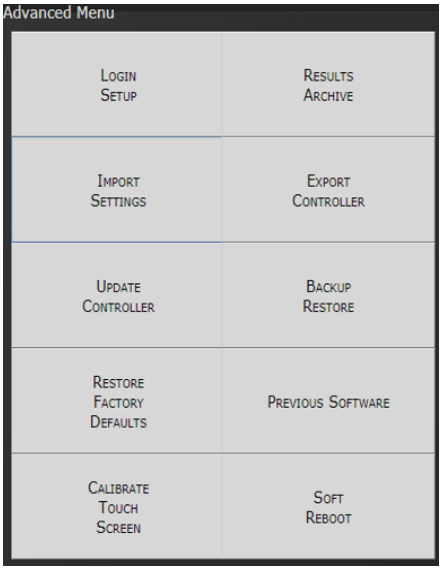


When a password is required it can be entered in this screen.

Three levels of access to the controller are available:

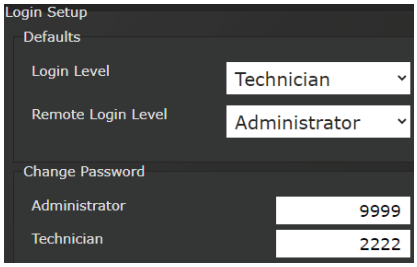
- **Operator:** Run/Login/View PSet screens available.
- **Technician:** Run/PSet/Job/Diagnostics and Login screens available.
- **Administrator:** All screens available.

4.10 Advanced



The 'Advanced' menu handles complex settings within the controller. Detailed descriptions are given in the following sections.

4.10.1 Login Setup

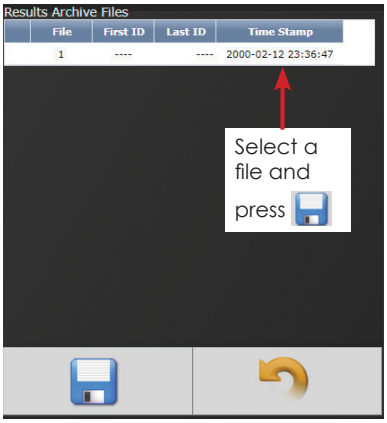


This screen allows the user to select the default Login level upon controller start up.

- **Operator**
- **Technician**
- **Administrator**

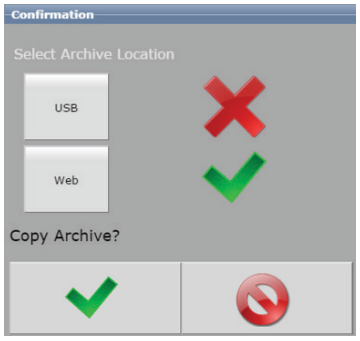
The Remote Login Level sets the default login level for remote sessions, allowing administrators to avoid logging in when accessing the controller over the network.

4.10.2 Results Archive



Approximately one million rundowns can be stored. Twenty files with approximately 50,000 rundowns are maintained at a time. The user can, at any time, save the runs to either a USB stick or to the Web as a CSV file imported directly into an Excel spreadsheet.

Using the touchscreen console, you can select multiple files to save.



Using the web option, you can select one of these files at a time to save (web option is default).

Select either USB or Web Archive location. See example of saved Excel files below

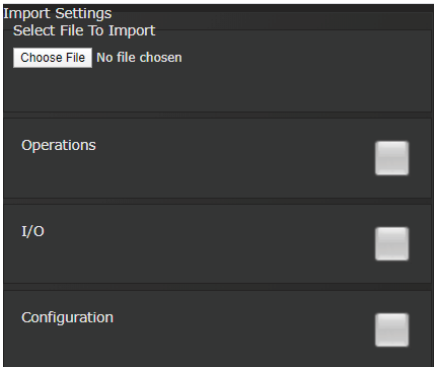
Example of Saved Excel File

Rundown	Job Num	Job Name	Sequence	Bolt count	Status	Date	Time	Torque	Status	Angle	Status	PSet Num	PSet Name	Tool Mode	Tool Serial	Id1 (ID #1	Id2 (ID #2	Id3 (ID #3	Id4 (ID #4)
2068	0		0	0	P	########	11:13:42	5.08	P	480	--	1			0				
2069	0		0	0	P	########	11:13:49	5.054	P	535	--	1			0				
2070	0		0	0	P	########	11:13:50	5.002	P	450	--	1			0				
2071	0		0	0	P	########	11:13:52	5.013	P	595	--	1			0				
2072	0		0	0	P	########	11:13:53	5.085	P	495	--	1			0				
2073	0		0	0	P	########	11:13:54	5.1	P	440	--	1			0				
2074	0		0	0	P	########	11:13:56	5.089	P	575	--	1			0				

4.10.3 Import Settings

This allows the user to download any previously saved settings onto the controller (refer to 'Export Controller' for help with saving data).

1. Plug the USB with an export file into any port on the controller.
2. From the Home screen, navigate to Advanced → Import Settings.
3. Select the settings to be checking the corresponding box ☑



Operations: This includes PSets and Jobs.

I/O: This includes I/O settings for the local I/O, Anybus, Modbus, and EtherNet/IP.

Configuration: This includes all settings of the controller except I/O, Master Spindle, Rundowns, PSets or Jobs.

Spindle: This includes any Master Spindle setup (i.e. number of spindles, IP addresses, etc).

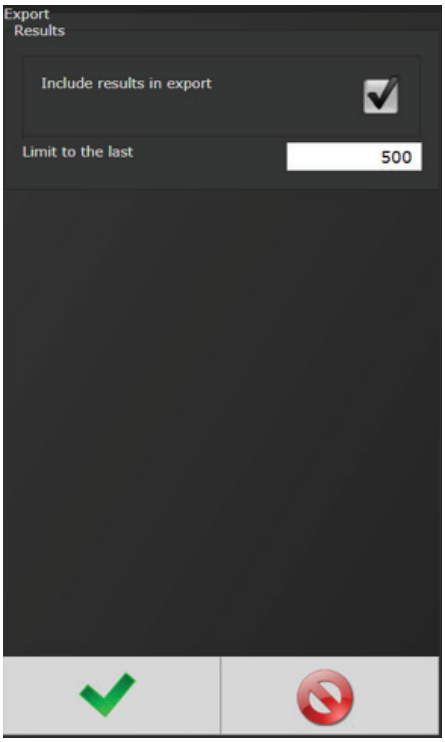
4. Press ✔ to accept the changes.
5. Press ✔ to proceed.
6. Press ✔ when the import is complete and the controller will restart.

Import settings that were exported from another controller via a USB flash drive. Use this to quickly apply the same settings across several controllers. For example, it is common to have multiple controllers with the same I/O configuration. Set up one controller with the correct I/O configuration and export the controller from Advanced → Export Controller. Now the I/O settings can be imported using this screen.

NOTE: Setting can only be imported from controllers running the same version of software.

4.10.4 Export Controller

This allows the user to save Configuration, Operations, I/O, and Spindle settings onto a USB flash drive.

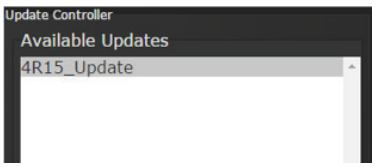


1. Plug a USB into any port on the controller.
2. From the Home screen, navigate to Advanced → Export Controller.
3. Press ✔ to continue, and the controller will begin the export process.
4. Press ✔ to complete the export.

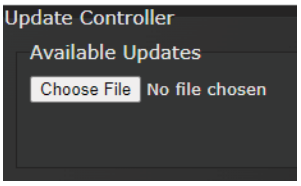
4.10.5 Update Controller

NOTE: Updated firmware versions will typically be sent via email zip file. Always save PSet and IP address information before upgrading controller.

Upgrading the AIMCO Gen IV Controller
Using the TouchScreen or a System Port browser session, navigate to the 'Advanced' menu. Click 'Update Controller.'

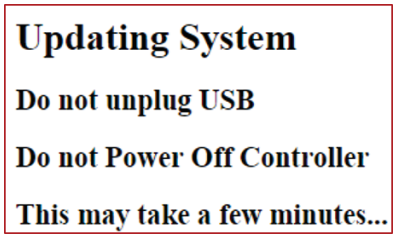


If a USB stick containing the zip file has been plugged in to the controller, the file will show in the Available Updates list. Select the latest release and click ✔ when ready.



If updating through a system port browser session, a dialog box will appear. Click the Choose File button and navigate to the folder where the zip file is located on the computer. Select the latest release and click ✔ when ready.

After the controller restarts, the user should see following messages



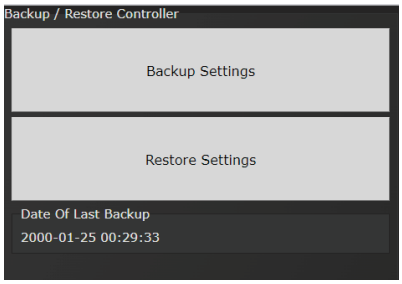
Controller Upgrade Notification

When the controller has finished, navigate to Diagnostics → Controller Overview to view any changes to the 'Software Versions'. Any system settings (Ethernet IP address, PSets, Jobs, etc.) will remain unchanged.

4.10.6 Backup Restore

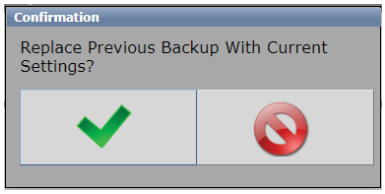
The Backup function allows the user to create an image of the controller software/firmware including all Configurations, Operations, I/O, and Spindle settings. This is used to create a point in which the controller can restore to if the need arises. In that case, the Restore function would be used.

1. From the Home screen, navigate to Advanced → Backup Restore.



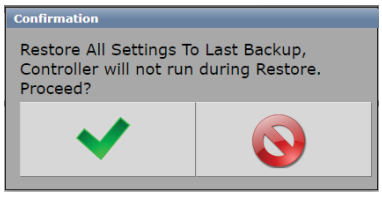
2. Press Backup to initialize the backup process.

3. Press ✔ to replace previous backup with current system, the backup process will begin.



4. Press **Restore** to initialize the restore process.

5. Press ✔ to restore all settings and firmware to last backup, the restore process will begin.



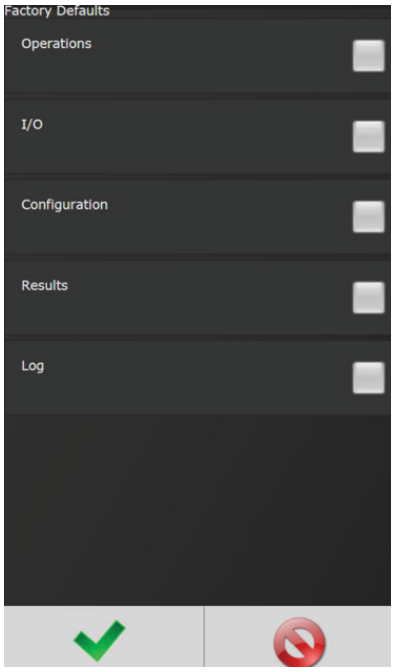
6. The controller will restart when finished.

4.10.7 Restore Factory Defaults

This allows the user to reset the controller's parameters to factory settings

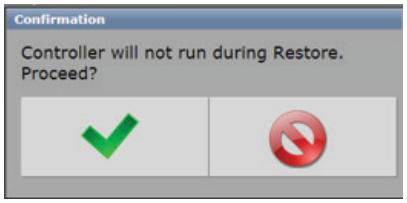
1. From the Home screen, navigate to Advanced → Restore Factory Defaults.
2. Select the settings to be changed and accept ✔

- **Operations:** This includes PSets and Jobs.
- **I/O:** This includes I/O settings for the local I/O, Anybus, Modbus, and EtherNet/IP.
- **Configuration:** This includes all settings of the controller except I/O, Master Spindle, Rundowns, PSets or Jobs.
- **Results:** This includes all rundown data/ information
- **Log:** This includes the Change, Information, Error, and Combined logs.

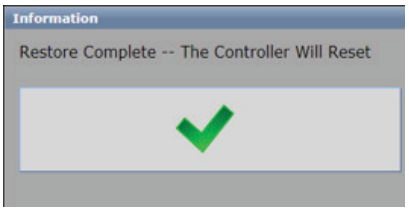


3. Press ✔ to accept the changes.

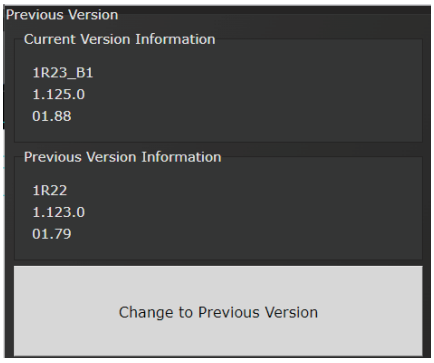
4. Press ✔ to proceed.



5. Press ✔ when the calibration is complete, the controller will restart.



4.10.8 Previous Software



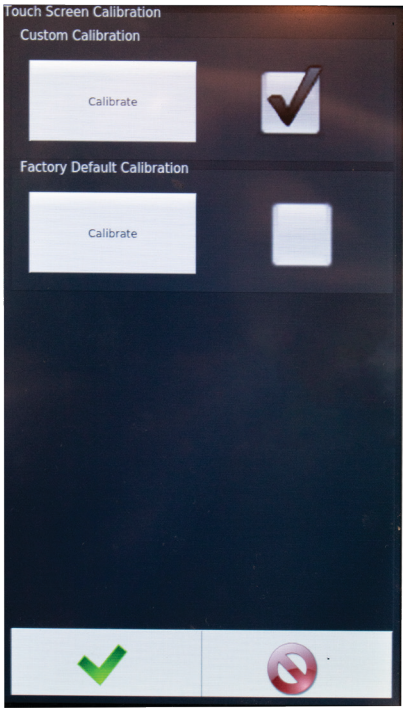
The 'Previous Software' page enables users to change the software to an alternate version. When the controller is updated, the previous version will be retained to easily revert versions. Settings are not affected. Any changes to settings are retained when changing to an alternate version. The screen shows the current version along with the version information of the alternate version.

This feature is only available for versions 3R19 going forward. It is not possible to revert to a release earlier than 3R19.

4.10.9 Calibrate Touch Screen

Custom and Factory default calibration are available on the controller console.

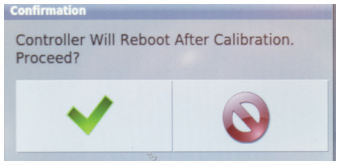
1. From the Home screen, navigate to Advanced → Calibrate Touch Screen.
2. Press ✔ to disable the tool.
3. Select the desired calibration



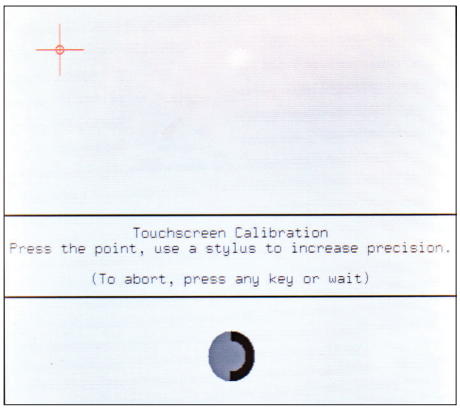
Custom Calibration: This allows the user to create a custom calibration setting for the touch screen.

Factory Default Calibration: This calibrates the touchscreen to the factory defaults.

4. Press ✔ to accept the selection.
5. Press ✔ to proceed.



In the case of custom calibration, a screen will appear with instructions on how to increase precision.



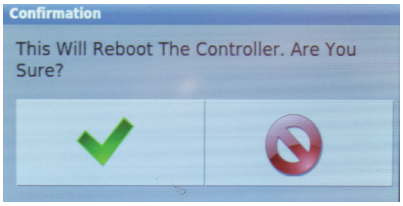
6. Press ✔ when the calibration is complete, the controller will restart.

NOTE: The controller may need to be reset before the custom calibration is possible.

4.10.10 Soft Reboot

Restart the controller without turning the power off.

1. From the Home screen, navigate to Advanced → Soft Reboot.
2. Press ✔ to proceed, the controller will restart.



5. Barcode Reader Details

The Gen IV controller supports the following barcode reader functionality:

- Support up to four identifiers.
- Each rundown result can be associated with up to four identifiers.
- Identifier(s) can be used to select a parameter set or a job.
- Display identifier(s) on controller.
- Ability to lock-out tool until correct identifier(s) is entered.
- Ability to block barcode reads while a job is in progress.
- Barcode reads (identifiers) can come from any or all the following sources:
  - Serial barcode reader
  - Open protocol
  - Fieldbus network
  - Telnet port

Solution
Regardless of the source (serial barcode reader, telnet, fieldbus, or protocol) each new string is passed through the same process:

- All four identifiers are reset to an empty string on power-up.
- Each received barcode is processed through a Barcode Match Table to look for a match, if one is found the barcode is accepted.
- Each fastening will then be associated with the received barcode(s) until a new one is received or they are reset.

Parameters
The parameters that pertain to the processing of barcode strings:

- The Barcode Match Table is used to identify the newly received barcode string.
- Which of the four Identifiers (ID#1-4) are required to enable the tool?
- Which of the four Identifiers (ID#1-4) to reset on a job complete?
- Parameter to disable all barcode reads while a job is in progress. If set, barcode reads will be disabled after the first fastener is ran until job is complete.

Barcode Match Table
The Barcode Match Table is used to identify which barcode has been received. The controller can have up to 99 entries (rows) in the table. Each entry has actions that will be performed when a matching barcode is received. The table is searched from top to bottom in an attempt to find a matching barcode. If none are found, the barcode is ignored.

Mask
The Mask is a string used to compare against the received barcode. The received barcode must be at least as long in length as the Mask. The Mask can also contain "don't care" characters of a decimal point or period in the string. These "don't care" characters are counted in the length but the actual received character in that position doesn't matter.

Identifier Type
The "Identifier Type" field identifies which identifier (ID#1-4) the received barcode will be stored in.

Action
Action can be one of the following:
- None
- Select PS#1-256
- Select Job#1-20

Reset ID
The "Reset ID" has the ability to reset other identifiers (ID#1-4) when barcode is received.

Examples:

Operator Scans
When a vehicle enters the station, the operator scans the VIN. The controller selects the correct job number and enables the tool. Each fastener will be identified with this VIN stored locally, and/or sent to a server for storage. The job settings will disable the tool when the job is complete.

Setup
In this example, there are three possible vehicle types each with its own job. The barcode scan will select the correct job (enabling the tool) and the scan will be stored into ID#1.

				Reset ID			
Mask	ID type	Action		ID#1	ID#2	ID#3	ID#4
"VIN…..7…"	ID#1	Select Job#	1	No	No	No	No
"VIN…..8…"	ID#2	Select Job#	2	No	No	No	No
"VIN…..9…"	ID#3	Select Job#	3	No	No	No	No

The tool enable/disable will be controlled by the job settings; the correct job will be selected by the barcode scan. The "ID Required to Enable the Tool" feature does not need to be utilized.

Required Identifiers for Tool Enable			
ID#1	**ID#2**	**ID#3**	**ID#4**
No	No	No	No

These settings are irrelevant since the only way to enable the tool is with a new job and the only way to select a new job is to scan a new barcode.

Reset Identifiers on Job Complete			
ID#1	**ID#2**	**ID#3**	**ID#4**
Yes	No	No	No

Examples
This is what the 'Operator Scans' example looks like once set up in the Barcode Configuration Screen (see "4.5.7 Bar Code Setup" on page 46).

Airbag Install
The customer wants to track the serial number of each airbag being installed, as well as the operator installing it. When the operator reports to the station, they will scan their employee ID. When the vehicle comes into the station, the operator scans the VIN of the vehicle and the serial number of the airbag. Once all three scans are received, the tool is enabled. Once the correct number of fasteners are installed, the tool is disabled by the job settings. From that point, the operator only needs to scan the vehicle and the airbag to enable the tool.

Setup
We will assign the employee ID to ID#1, the vehicle VIN to ID#2, and the airbag serial number to ID#3. Scanning a new employee ID will reset the other IDs and force a scan of the vehicle VIN and airbag serial number. The scan of the vehicle VIN will also select the correct job number.

Mask	ID type	Action		Reset ID			
				ID#1	ID#2	ID#3	ID#4
"EMP…."	ID#1	None		No	Yes	Yes	No
"VIN……."	ID#2	Select Job#	1	No	No	No	No
"SN……."	ID#3	None		No	No	No	No

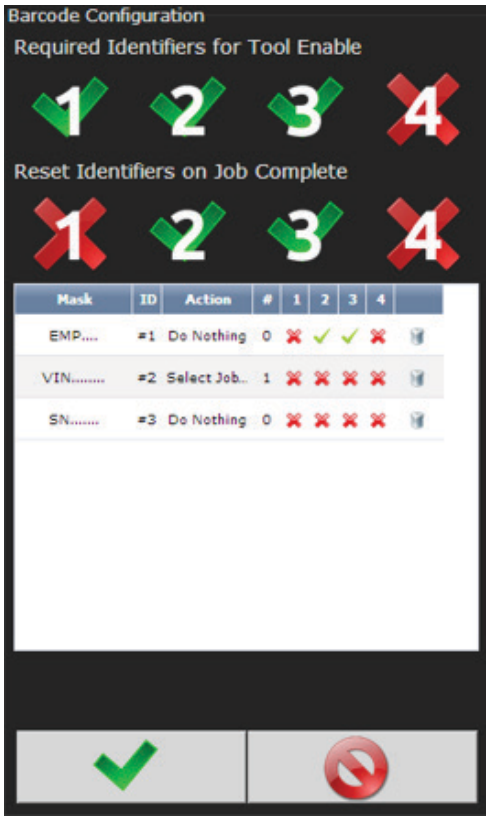
Once all three scans are received, the tool will be enabled.

Required Identifiers for Tool Enable			
ID#1	**ID#2**	**ID#3**	**ID#4**
Yes	Yes	Yes	No

When job is complete, the vehicle VIN will be reset and the airbag serial number, but not the employee ID; this way subsequent vehicles will only require a VIN and S/N to enable tool.

Reset Identifiers on Job Complete			
ID#1	**ID#2**	**ID#3**	**ID#4**
No	Yes	Yes	No

This is what the Airbag Install example looks like set up in "4.5.7 Bar Code Setup" on page 46.



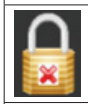
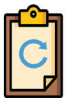
6. Glossary of Terms

Acceleration	This setting controls how quickly the tool comes to programmed RPM. The value is stated in thousand(k) revolutions per minute (RPM) per second(s). Default setting is 10 which means that at the start of the rundown or stage, the tool will reach 10,000 RPMs in a one second period of time. Given the speed ratings of the tools in the AcraDyne range, this means that the programmed RPM will instantly be running at the throttle press, or start, of the stage. To increase the time in which the tool comes up to speed (aka Soft Starting) the value should be reduced to the level desired. Controller Firmware will limit the programmed value to effect the tool down to 10% of its rated speed. This means that a 1,000 RPM tool can be set to accelerate at 100 RPM/Second. Should an entry be made that is lower than this value, the Firmware of the controller will run the step/stage at no less than 100 RPM/Second <u>For a theoretical example:</u> A setting of 1 will result in the tool accelerating (reaching the programmed RPM setting) in a 1,000 RPM step over a time period of 1 second. If the programmed speed was 2,000 RPM it would take 2 seconds to reach that 2,000 RPM setting during that step or stage of the rundown. A setting of .5 will result in the tool accelerating (reaching the programmed RPM setting) in a 500 RPM step over a time period of 1 second. Using the 2,000 RPM example, it would take the tool 4 seconds to reach 2,000 RPM. **Summary: Lower values equal slower ramp up to programmed speed.**
Accept Tone	Controls tone made from handle of handheld tools for accepted fastening cycles.
Angle	Degree fastener rotates from snug, or threshold level, to peak torque.
Cycle Complete	Torque level that determines completion of a fastening cycle.
High Angle	When peak angle recorded exceeds High Angle, the fastening cycle is recorded as a reject for High Angle, the High Angle light (flashing yellow) illuminates, and fastening cycle is given an overall status of NOK.
High Torque	When peak torque recorded exceeds the High Torque, the fastening cycle is recorded as a reject for High Torque, the High Torque light (flashing red) illuminates, and fastening cycle is given an overall status of NOK.

Job	A Job is a collection of Psets or Multi-stages, which are useful when performing several multiple fastening operations, each with different requirements. This is convenient since the operator does not have to select a new Pset or Multistage for every fastening.
Low Angle	When the peak angle recorded during the Angle Audit Step fails to reach the Low Angle, fastening cycle is recorded as a reject for Low Angle, the low angle light (flashing yellow) illuminates, and fastening cycle is given an overall status of NOK.
Low Torque	When the peak torque recorded fails to reach the Low Torque, fastening cycle is recorded as a reject for Low Torque, the Low Torque light (flashing red) illuminates, and fastening cycle is given an overall status of NOK.
MFB	Multi-Function Button
Multi-stage	In some instances, it is necessary to perform a fastening in several stages. This requires specific fastening strategies. Multi-stage allows user to create linear sequences up to 256 Psets to perform a fastening divided into stages.
Parameter Set	A Parameter Set is a collection of instructions that define how the tool should perform the fastening process. It may be selected from the console or device such as a socket tray or PC.
Snug Torque	Controller begins to monitor tool for angle at a preselected threshold torque. Any increase in angle, after the snug point, results in a corresponding increase in tension or clamp load within the joint.
Speed	Speed at which tool operates during the initial portion of the fastening cycle prior to downshift.
Spindle	A spindle represents a connection to a handheld, or fixtured, tool connected to a controller.
Strategy	Identifies the variables being used to control tool during a fastening cycle.
Thread Direction	Sets assembly direction to clockwise (CW) or counter clockwise (CCW).
Threshold Torque	Sets point at which tool is “In Cycle”.
Torque Calibration	Determines how torque values are assigned to the electrical signals for torque transducer on tool. Value is unique to each tool and changes over time.
Torque Target	When the tool is being controlled for torque, the torque target instructs controller when to shutoff tool. Torque target should be greater than Low Torque and less than High Torque, this is required for torque control.

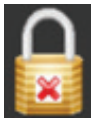
7. Icons Defined

Icon	Description	Function	Where Used
	Home Navigation Button	Navigate to the main menu ("HOME") screen.	All screens except for edit screens.
	Run Navigation Button	Navigate to the Run Screen.	All screens except for edit screens.
	Run Screen Select Buttons	Switch between the different run screen pages.	Run Screen
	Go Back Button	Navigate to one menu level back.	All screens except for edit screens.
	Accept Changes Button	Accept the changes made and return to the parent screen.	Edit screens
	Cancel Changes Button	Reject the changes made and return to the parent screen.	Edit screens
	Add New Button	Add a new item (Pset, Stage, Job, and other).	PSet and Job edit screens.
	Edit Button	Edit selected Item.	PSet and Job edit screens.
	Move Up and Down Buttons	Move selected item up or down in the sequence order.	PSet and Job edit screens.
	Copy Button	Copy selected Items	PSet, Job, and other edit screens.
	Delete Button	Remove or un-assign selected items.	Edit and list view screens.
	Filter Button	Filter Items in a list or table.	List view screens
	Save Button	Save selected item to file.	List view screens
	Select Columns Button	Allows customization of columns shown on the Results Screen.	Results Screen
	Fault Indicator	Fault exists that is preventing the tool from running (can be pressed for more Info).	Run Screen
	Invalid PSet Indicator	Selected Pset does not exist or is not valid.	Run Screen

Icon	Description	Function	Where Used
	Barcode Scan Required Indicator	A barcode is required to enable the tool.	Run Screen
	Job Complete Indicator	Job is complete.	Run Screen
	Lock on Reject (LOR)	Lock tool on rejected fastener.	Run Screen
	Disassembly	A disassembly event has been detected.	Run Screen
	Job Reset Complete	Reset Job has finished. Results from last successful rundown of a job are cleared.	Add New Job Screen
	Scan	Search for accessories on the network	Add Accessories Screen

8. Stop Codes

If a Stop condition is detected that prevents the tool from running, a code will appear on the LED display. Any active stop conditions are also displayed on the RUN screen.

Code	Icon	Description
IO		Stopped or Disabled from Physical 24 volt IO input
ABUS		Stopped or Disabled from ANYBUS
MODB		Stopped or Disabled from Modbus
EIP		Stopped or Disabled from Ethernet IP
RTU		Stopped or Disabled from Modbus RTU
OP		Stopped or Disabled from Open Protocol
OP		Lost Open Protocol Connection
REV		Disassembly Disabled
ARM		Tool Requires Arming – MFB button configured to enable the tool to run.
JOB		Job Sequence Complete
JOB		Job Complete
JOB		XML Count Complete
LOR		Locked on Reject

Code	Icon	Description
BRCD		Bar Code ID scan required to enable tool
SRVC		Tool Disabled For Service - Tool service or calibration interval has expired
INVP		Invalid PSet - Parameter set number for a non-existent Pset has been selected to run. Most likely via one of the following methods: ◦ Job ◦ MFB ◦ I/O
INVP		PSet outside of Job - Parameter set number outside of the job has been selected. Most likely via one of the following methods: ◦ MFB ◦ I/O
INVJ		Invalid Job - Job number for a non-existent Job has been selected to run. Most likely via one of the following methods: ◦ MFB ◦ I/O
PSET		PSet Mismatch
SPND		Spindle Not Configured – Spindle selected to run from a Multi-Spindle Job has not been configured
NET		XML Disconnected
XML		Stop from XML
NOK		XML Max Rejects Exceeded
FLT		Controller Fault - Error has been detected. See fault code list for details

9. Error Codes

If an error condition is detected that prevents the tool from running, a fault code will appear on the LED display. Any active faults are also displayed on GUI RUN screen. Fault history can be viewed in the Controller Error Log.

Gen4 Common Hardware Fault Codes

Code	Fault Type	Description	Possible Causes
FH17	1.8vdc MB out of tolerance	Main board 1.8 bus voltage exceeds electrical limits	• Faulty Controller main board or other Controller electronics
FH18	1.8vdc SOM out of tolerance	System on Module 1.8 bus voltage exceeds electrical limits	• Faulty Controller main board or other Controller electronics
FH19	3.3vdc out of tolerance	Main board 3.3 bus voltage exceeds electrical limits	• Faulty Controller main board or other Controller electronics
FH20	5vdc out of tolerance	5 Volt bus voltage out of range	• Faulty power supply or wiring • Faulty Controller main board or other Controller electronics
FH21	9vdc out of tolerance	9 Volt bus voltage out of range	• Faulty power supply or wiring • Faulty Controller main board or other Controller electronics • Faulty tool cable • Faulty tool electronics or wiring
FH22	24 volt level low	24 Volt I/O power not detected	• Faulty power supply or wiring • Short or other problem with external connections to the 24Volt I/O port.
FH23	Controller temp high	Controller's internal temperature exceeds limit	• Ambient air temperature exceeds rating of Controller
FH24	+15vdc out of tolerance	+15 Volt bus voltage out of range	• Faulty power supply or wiring • Faulty Controller main board or other Controller electronics • Faulty tool cable • Faulty tool electronics or wiring
FH25	–15vdc out of tolerance	–15 Volt bus voltage out of range	• Faulty power supply or wiring • Faulty Controller main board or other Controller electronics • Faulty tool cable • Faulty tool electronics or wiring
FH32	Processor Fault	RTOS processor not communicating with the Application processor	• Faulty mainboard electronics • RTOS processor firmware corrupted or not loaded • Faulty SOM board or connector

IEC (AcraDyne DC Tool) Specific Fault Codes

CODE	Fault Type	Description	Possible Causes
FT01	Tool not connected	Tool communication timeout	• Tool not connected • Faulty tool cable • Faulty tool electronics or wiring
FT02	Invalid TID parameters	Tool parameter file not compatible with Controller	• Corrupt tool ID memory location • TID file not loaded in tool
FT04	Torque signal out of Range	Tool torque signal voltage is beyond electrical limits	• Tool not connected • Faulty tool cable • Faulty transducer • Transducer electronics not calibrated • Faulty tool/controller electronics or wiring
FT05	Torque tare value out of range	Tool torque signal no load voltage is out of range	• Transducer electronics significantly out of calibration • Faulty transducer • Faulty tool cable • Tool gear binding • Faulty controller electronics or wiring
FT06	Motor hall states invalid	Hall signals states are all high or all low	• Tool not connected • Faulty tool cable • Faulty tool electronics or wiring • Faulty motor halls or wiring
FT07	Motor halls skipping states	Hall signal sequence incorrect	• Faulty tool cable • Faulty tool electronics or wiring • Faulty motor hall or wiring • Hall signal leads are connected incorrectly • Too many tool extension cables
FT08	Tool ground not connected	Tool ground conductors not connected	• Tool not connected • Faulty tool cable • Faulty tool ground wires • Faulty tool electronics or wiring
FD12	Drive not connected	Drive CAN communication time out	• Faulty Controller main board electronics • Faulty drive electronics or connection
FD13	Drive Fault SW	Drive reporting fault via CAN communication	• Tool not connected • Faulty tool cable • Faulty tool motor • Application exceeds capability of drive • Faulty drive
FD14	Drive Fault HW	Drive reporting fault via IO signal	• Tool not connected • Faulty tool cable • Faulty tool motor • Application exceeds capability of drive • Faulty drive
FD15	Drive Vbus high	Drives DC bus voltage exceeds electrical limits	• AC supply power exceeds voltage ratings of Controller
FD16	Drive Vbus low	Drives DC bus voltage is too low to run tool	• Supply power cycled too quickly. Five second delay required after switching off the Controller before turning back on.
FS26	Power on throttle	Run command on power up	• Tool laying on lever on power up • Tool buttons out of calibration • Run command from logic I/O on power up.
FS27	Locked rotor	Motor has stalled for more than 100 milliseconds	• Poor parameter settings for application. • Torque signal out of calibration • Faulty tool gearing or motor • Corrupted TID parameters • Faulty Controller or tool electronics
FS28	Target out of range of tool	Parameter set torque target out of range of rated tool capability	• Target torque exceeds tool capability • Joint Compensation Ratio set too low. • Corrupted TID parameters
FS29	Invalid tool	Tool configuration not compatible with parameter set	• Tubenut tool commanded to run a parameter set with left hand thread direction or with an unfastening stage • Tubenut tool commanded to go in the disassembly direction
FS31	Lost Master Start Signal	Lost Connection to Master Spindle	• Faulty Ethernet Connection • RTOS processor firmware corrupted or not loaded • Faulty SOM board or connector • Controller export performed during rundown

10. Dual-Lever Tools Requiring Two-Handed Operation

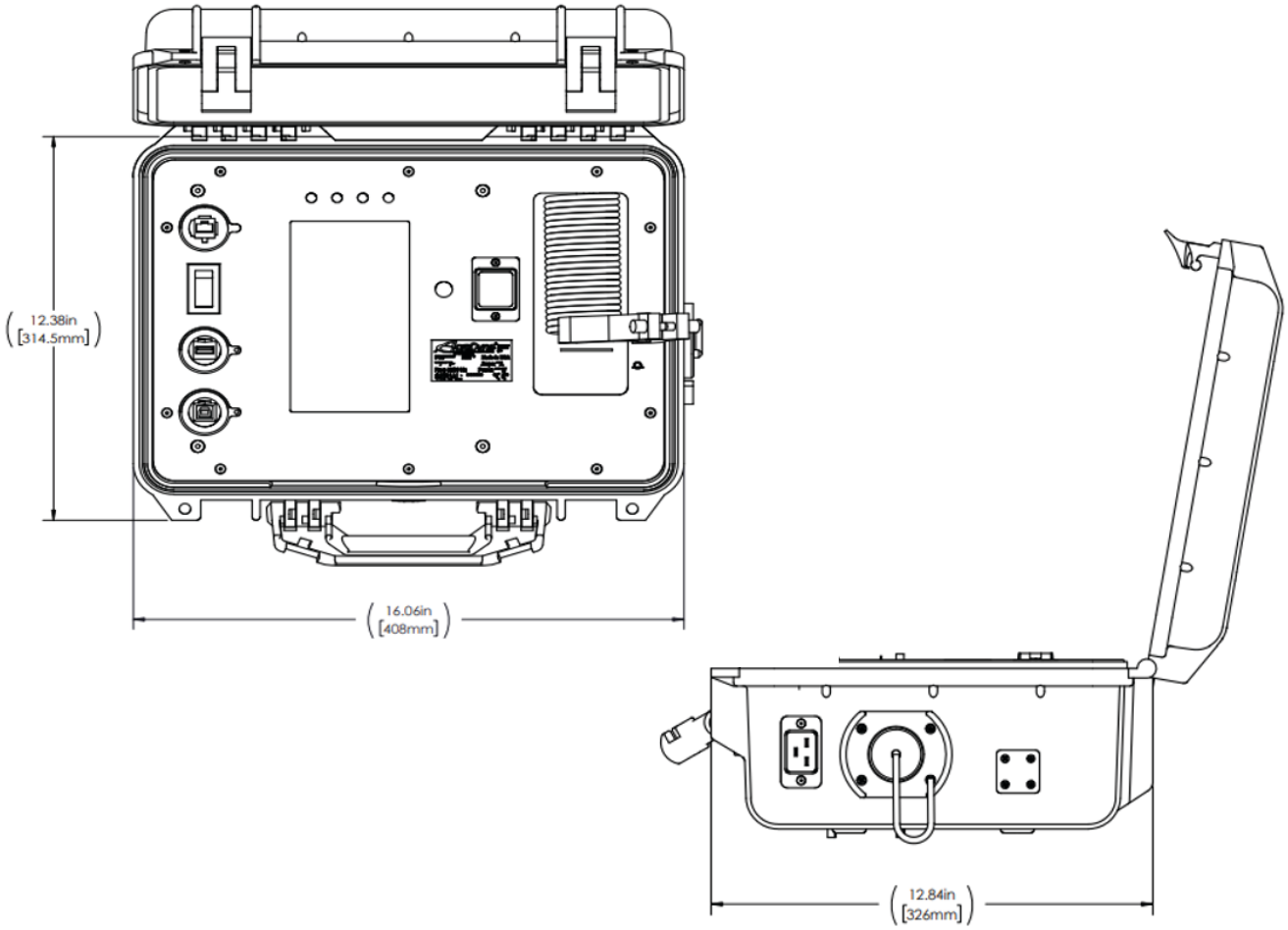
Two Handed Functionality

- Tool will not run unless both switches are pressed within one second of each other.
- If the one second timer times out, both switches must be released to reset the timer.
- If either trigger is released the tool stops.
- To restart the tool, both switches must be released and pressed within one second of each other.
  NOTE: All settings in Controller → Start Input Configuration will be ignored.
  - I/O cannot be used to start a two-handed tool.
  - Latching throttle is disabled for a two-handed tool.
- Exceptions exist for Tubenut tool homing.

Tubenut Tool Homing Exceptions for Two Handed Functionality

- If controller's tubenut homing configuration is set to RELEASE:
  - Releasing either, or both, of the levers will initiate the homing sequence.
  - Homing will continue until sequence is complete.
- If controller's tubenut homing configuration is set to RELEASE AND REPRESS:
  - Releasing either of the levers, then pressing both levers will initiate the homing sequence.
  - Homing will continue while both of the levers are being pressed.
  - If either lever is released, before homing is complete, tool will stop and homing will pause until both levers are pressed.
  - To restart tool, after homing is complete, both switches must be released and pressed within one second of each other.

11. Dimensions



12. Specifications

Mechanical:

Dimensions	Width	6.25 in	159 mm
	Height	15.75 in	400 mm
	Depth	12.5 in	316 mm
Weight:	iEC4W	18.6 lbs	8.4 kg
	iEC4W1	18.6 lbs	8.4 kg
	iEC4W2	18.6 lbs	8.4 kg

Operating Conditions:

Temperature:	32 to 122 °F (0 to 50 °C)
Humidity:	Non-condensing
Ingress Protection:	IPx4

If attempting to use tooling below 0°C, allow the system to warm up by running in a no-load state until acceptable temperatures are reached.

Electrical:

Supply Voltage:	iEC4W	120 Vac / 230 Vac
	iEC4W1	120 Vac
	iEC4W2	230 Vac
Phase:	1Φ	
Frequency:	50/60 Hz	
Power:	3.5 kW	
Maximum Continuous Current Draw:	15 Amps	

Absolute Supply Voltage Ranges	iEC4W:	90 – 132 Vac / 180 – 264 Vac
	iEC4W1:	90 – 132 Vac
	iEC4W2:	180 – 253 Vac

- 15 – 20A, dedicated service recommended when supplying 120Vac
- 10 – 20A, dedicated service recommended when supplying 230Vac
- Service Breakers with a **C**, **K**, or **D** Trip Curve are recommended

Power Cord Receptacle Type: IEC 320-C20

13. Tubenut Tool Setup Details

13.1 Overview

The following describes the setup required for tubenut tool operation. This includes determining the values for tubenut specific TID parameters (parameters residing in the tool memory) and Gen IV controller parameters.

13.2 Tubenut Homing

13.2.1 Tubenut Home TID parameters

The tubenut TID parameters can be viewed and modified from the Tool → Tool Setup screen. The tool to be configured must be connected to the controller.

- **Home Detection Torque - Home (in*Lb)**
  - When tool is homing, reaching this torque indicates to controller that the tool output socket has reached the Home stop and is in the open position.
  - If tool output does not attempt to return, or does not completely reach the Home position, this value is too low.
    NOTE: Setting this value too high can potentially damage the tool.
  - Units: lbf-in
  - TID memory location: 53

- **Hold at Home Torque - Open Loop (in*Lb)**
  - After reaching the Home position, this torque is applied against the Home stop to prevent socket from bouncing to a partially closed position.
  - This value is typically set to a value slightly lower than the Home detection torque.
  - If socket is bouncing back to a partially closed position, after reaching the Home stop, this value is too low.
    NOTE: Setting this value too high can cause the socket to snap back to the Home stop too quickly and potentially damage the tool.
  - Units: lbf-in (approximation)
  - TID memory location: 54

13.3 Setting the Tool's Tubenut Home TID Parameters

- Set the Hold at Home Torque = 0
- Set the Home Detection Torque = 1
- Free-run tool and watch the homing routine while making the adjustments below.
- Gradually increase the value for the Home Detection Torque until tool reliably returns to the Home position.
- When a good value for the Home Detection Torque is found, if the tool is bouncing back to a partially closed position after hitting the Home stop, gradually increase the value for the Hold at Home Torque until bounce back is eliminated.

13.4 Controller Parameters Affecting Tubenut Homing

Controller parameters for tubenut operation can be viewed and modified from the Controller → Tool Setup → Disassembly and Tubenut screen.

- **Tubenut Homing Max Speed:**
  - Speed the tool output socket travels when returning to the Home position.
  - Decreasing this can reduce the impact force when hitting the Home stop.
    NOTE: Care must be taken, increasing the speed above the default value; too high of a value can greatly increase how hard the output will hit the Home stop and potentially damage the tool.
  - Units: RPM of the tool output socket in the homing direction.
  - Default value: 50 RPM
  - Range: 1 to 200 RPM

- **Tubenut Homing Acceleration:**
  - Rate at which speed of tool ramps to the homing speed.
  - Units: kRPM/second
  - Default value: 0.5 seconds
  - Range: 0.1 to 10 seconds

- **Tubenut Homing Reverse Dwell Time:**
  - Amount of time before the output is allowed to Home, after rundown is complete and tool lever is released.
  - Units: Seconds
  - Default value: 0.5 seconds
  - Range: 0 to 2 Seconds

- **Tubenut Home Dwell Time:**
  - Amount of time tool holds at Home to prevent bounce back
  - Too short of Home dwell time can increase the occurrence of bounce back. However, decreasing the homing speed can decrease the severity of bounce back after the Home stop is reached and allow for a shorter dwell time.
  - Units: Seconds
  - Default value: 0.5 Seconds
  - Range: 0 to 2 Seconds

13.5 Tubenut Pinch Detection

13.5.1 Obstruction Detection TID Parameters

The tubenut TID parameters can be viewed and modified from the Tool → Tool Setup screen. The tool to be configured must be connected to controller.

- Obstruction Detection Torque - **(in*Lb)**
  - At start of rundown, before the output rotation has passed though the Obstruction Check Zone (where output is open at the start of the fasting cycle), the tool will stop and fastening cycle will be aborted if this torque is exceeded.
  - If tool stops, when output is open during this first part of the rundown, without any obstruction, the value is too low.
  - Units: lbf-in
  - TID memory location: 53

13.5.2 Setting the Tool's Tubenut Obstruction Detection

Parameters

- Set value for the obstruction torque just high enough so tool will reliably overcome gear friction and make it past the obstruction checking zone.
- Check torque of the stop on obstruction feature by measuring the actual "pinch" torque the tube nut produces at the start of the rundown when the jaws are open (within the obstruction detection angle range). This can be done on a semi-tightened joint simulator set for a hard joint, while auditing the torque.
  NOTE: Gear friction in the tubenut head can greatly affect the ability to reliably detect an obstruction.

13.5.3 Controller Parameters Affecting Tubenut Pinch Detection

Controller parameters for tubenut operation can be viewed and modified from the Controller → Tool Setup → Disassembly and Tubenut screen.

- Obstruction Check Angle
  - Angle of travel from start of fasting cycle where, if an obstruction is detected inside this zone, the tool will stop and the fastening cycle will be aborted.
  - Units: Degrees of rotation of the output from Home to where the output is closed.
  - Default value: 90 Degrees
  - Range: 0 to 180 Degrees
- Obstruction Check Speed Limit
  - Maximum speed output will run during the check for obstructions.
  - Decreasing this can reduce the impact force when hitting an obstruction.
    NOTE: Care must be taken increasing the speed above the default value. Too high of a value can greatly increase how hard the output will hit the obstruction.
  - Units: RPM of the tool output
  - Default: 70 RPM
  - Range: 1 to 200 RPM
- Obstruction Check Acceleration Limit
  - Rate at which the speed of the tool ramps to Obstruction Check Speed.
  - Units: kRPM/second
  - Default value: 0.5
  - Range: 0.1 to 10

13.5.4 Tubenut Homing Start Input Logic Selection

The controller parameter for tubenut homing Start Input Logic can be viewed and modified from the controller → Tool Setup → Start Input screen.

- Tubenut Homing Start Input logic:
  - Lever action required to start the Home sequence.
  - Options:
- Home on release and repress of the lever (default)
- Home on release of the lever

14. Troubleshooting

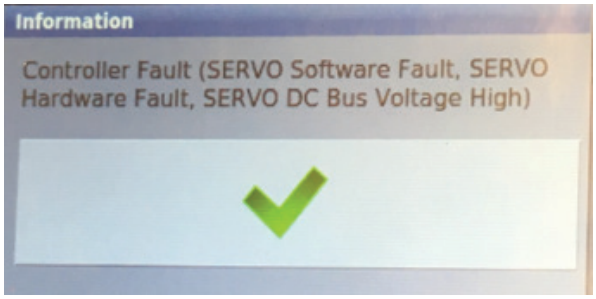
Issue: LED Frozen Showing "Initializing"

Solution: The rear SD card containing the system UI may have become unseated. Turn off controller power. Depending on vintage, remove the label or cover plate to access the card slot. Gently depress the card and release to unseat it. Gently then press the card into the slot until feeling and hearing the locking click indicating it is secure. Replace the label or cover plate and power the controller back on.

Issue: System Port IP Connectivity using USB Cabling

Solution: In most cases, connectivity will be automatic when connection between the controller SYSTEM PORT and a PC USB Port are made. Confirmation of the connection is noted by the presence of a USB Ethernet/RNDIS Gadget in the PC Adapter list. Should this connection not be established, specific instructions are located at the product manuals page at https://www.aimco-global.com/manuals under the heading **System Port Connectivity Troubleshooting for PCs**.

Issue: DC Bus High Voltage Warning when using an HT Tool



Solution: Adding a Brake Stop of 0.5 to 1.0 Second stage to the end of the rundown should eliminate this issue.

15. AIMCO Warranty

NEW TOOL AND ACCESSORY WARRANTY

Any new tool or accessory branded with the AIMCO, URYU, AcraDyne or Eagle Industries name, and purchased from AIMCO, or through one of its authorized distributors or agents, is warranted to the original buyer against defects in materials and workmanship for a period of one (1) year* from date of delivery. Under the terms of this warranty, AIMCO will repair or replace any product or accessory warranted here under and returned freight prepaid proving to AIMCO's satisfaction to be defective as a result of workmanship or materials. In order to qualify for this warranty, written notice to AIMCO must be given immediately upon discovery of such defect, at which time AIMCO will issue an authorization to return the tool. The defective item must be promptly returned to an authorized AIMCO service center with all freight charges prepaid.

REPAIRED TOOL WARRANTY

Once a tool is beyond the new product warranty period as detailed above, AIMCO repairs are subject to the following warranty periods: pneumatic tools: 90 days*; electric tools and Acra-Feed: 90 days; battery tools: 30 days*; DC Electric tools: 90 days*

EXCLUSION FROM WARRANTY

This warranty is valid only on products purchased from AIMCO, or through its authorized distributors or agents. AIMCO shall have no obligation pursuant to the AIMCO Warranty with respect to any tools or accessories which in AIMCO's sole judgment have been altered, damaged, misused, abused, badly worn, lost or improperly maintained. This Warranty is null and void if the customer, or any other person other than an authorized representative of AIMCO, has made any attempt to service or modify the tool or accessory prior to its return to AIMCO under this Warranty.

The warranty provision with respect to each such product may be amended by AIMCO from time to time in its sole discretion. The liability of AIMCO hereunder shall be limited to replacing or repairing, at its option, any products which are returned freight prepaid to AIMCO and which AIMCO determines to be defective as described above or, at AIMCO's option, refunding the purchase price of such products.

AIMCO reserves the right to make periodic changes in construction or tool design at any time. AIMCO specifically reserves the right to make these changes without incurring any obligation or incorporating such changes or updates in tools or parts previously distributed.

THE AIMCO WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND AIMCO EXPRESSLY DIS- CLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THIS WARRANTY SETS FORTH THE SOLE AND EXCLUSIVE REMEDY IN CONTRACT, TORT, STRICT LIABILITY, OR OTHERWISE.

THIS WARRANTY IS THE ONLY WARRANTY MADE BY AIMCO WITH RESPECT TO THE GOODS DELIVERED HEREUNDER, AND MAY BE MODIFIED OR AMENDED ONLY BY A WRITTEN INSTRUMENT SIGNED BY A DULY AUTHORIZED OFFICER OF AIMCO.

LIMITATION OF LIABILITY

AIMCO'S LIABILITY PURSUANT TO WARRANTY OF THE PRODUCTS COVERED HEREUNDER IS LIMITED TO REFUND OF THE PURCHASE PRICE. IN NO EVENT SHALL AIMCO BE LIABLE FOR COSTS OF PROCUREMENT OF SUBSTITUTE GOODS BY THE BUYER. IN NO EVENT SHALL AIMCO BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL OR OTHER DAMAGES (INCLUDING WITHOUT LIMITATION, LOSS OF PROFIT) WHETHER OR NOT AIMCO HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH LOSS, HOWEVER CAUSED, WHETHER FOR BREACH OR REPUDIATION OF CONTRACT, BREACH OF WARRANTY, NEGLIGENCE OR OTHERWISE. THIS EXCLUSION ALSO INCLUDES ANY LIABILITY WHICH MAY ARISE OUT OF THIRD-PARTY CLAIMS AGAINST BUYER. THE ESSENTIAL PURPOSE OF THIS PROVISION IS TO LIMIT THE POTENTIAL LIABILITY OF AIMCO ARISING OUT OF THIS AGREEMENT AND/OR SALE.

Note: The AIMCO Warranty confers specific legal rights, however some states or jurisdictions may not allow certain exclusions or limitations within this warranty.

* All tools evaluated and deemed no problem found or tools to be sent back unrepaired are subject to an inspection fee (1/2-hour labor rate charge).

** All warranty periods addressed herein are determined using a standard shift, eight-hour workday.

05-25

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